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GAS

29th Year of Publication

AUGUST 1953 • VOLUME XXIX • NUMBER 8

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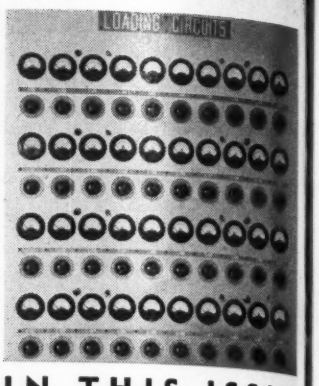

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RAYMOND A. GROTE, Art Director

Publication Office

198 South Alvarado St.
Los Angeles 57, California
Phone DUnkirk 7-4337

Advertising and Editorial Offices

CHICAGO
WILLIAM O. DANNHAUSEN,
District Manager
333 North Michigan Ave.
FRanklin 2-4615

CLEVELAND
FRANK J. ENRIGHT,
District Manager
JOSEPH L. GERYK,
Assistant District Manager
1836 Euclid Ave.
PRospect 1-4584

NEW YORK
PETER WILE,
District Manager
11 West 42nd St.
CHickering 4-1969

TULSA
CRAIG ESPY,
District Manager
2441 E. 25th Place
P.O. Box 4055
7-9807

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Thermally Thinking

SPOT NEWS AND COMMENT ON GAS INDUSTRY AFFAIRS

Highlighting the News

No more common carriers?

Carrying a step further the recent action of Interior Secretary McKay in junking his predecessor's close-gripped regulation of common carrier gas lines, Congress has moved to exempt gas lines completely from the Mineral Leasing Act. The Poulson bill (HR 5664) provides "that the common carrier provisions of (Sec. 185) shall not apply to any natural gas pipeline operated by any person subject to regulation under the Natural Gas Act or by any public utility subject to regulation by a state or municipal regulatory agency having jurisdiction to regulate the rate and charges for the sale of natural gas to the consumer . . ." It has been passed by committees of both houses.

Arkansas may fight alone in test of tidelands law

Despite the earlier claim of Arkansas' Atty. Gen. Tom Gentry that "15 or 16" other states would aid in prosecuting the district court test of the constitutionality of the new law giving tidelands title to the states, President Harold R. Fatzer of the National Assn. of Attorneys General, has given assurance that the association will defend the law it helped to pass. Mr. Gentry charges passage of the law was an "invalid attempt to abdicate the sovereignty of the United States to a few of the states."

New Northwest markets sought

Trans-Northwest Gas Co. which proposes to pipe Canadian gas through the Northwest, is surveying for possible future service several new areas that didn't look promising when the original surveys were made several years ago. South central Washington, northeastern Oregon, and southern Idaho are the regions that appear to hold promise.

Ten-city test

Market studies of 10 widely scattered cities will soon get under way as the first step in applying the AGA-GAMA gas industry development program. Procedures for the pilot tests are being worked out by the AGA staff, should be ready for distribution any day now. Also, to expedite action, two-day "clinics" have been set up in several key areas.

Range shipments dip

For the first time this year, gas range shipments in June fell behind the corresponding month in 1952. The 169,300 units moved by manufacturers totaled 3.6% less than the 175,700 shipped in June 1952. However, strong gains in April and May gave the second quarter an 11.6% margin over last year, and for the six months the cumulative total of 1,144,600 is 10.2% better than 1952's first half.

Many Island proved up

In southeastern Alberta, Britalta Petroleums Ltd. and Deep Rock Oil have delineated the commercial area of Many Island Lake field to the satisfaction of the Alberta government, and are suspending drilling pending development of a market. Gross recoverable reserves at 100 psi are estimated at 540 billion. The location is strategic for eastern export.

Still more compromises

Further examples of the trend toward compromising wholesale rate cases and thus bypassing a lot of the usual red tape have attracted attention recently. After Alabama-Tennessee Natural Gas Co., the Florence (Ala.) transmission firm, had scaled down rate increase demands from $311,000 to $148,000, thus winning the consent of its customers and consequently FPC, Tennessee Gas Transmission Co. picked up the cue and went into a huddle with its customers to see if something couldn't be worked out on its $17,850,000 increase application. The boost has been in effect under bond since February.

Natural gas stocks slip

Price index of common sagged in June, reflecting, according to AGA, "the general uncertainty of prevailing market conditions." Transmission company stocks led the way with a 9.5% slide; 30 natural gas company stocks were off 7.1%; distributing company common stocks dipped 2.5%. Dividends, however, were up (12.4% for the 30 stocks). Composite yield, 5.5%.

An Eye on the Capital

Controls on everything

Perhaps the most significant Washington news, in the final month of Congress, was the action of Rep. John W. Heselton (R.-Mass.) in introducing a bill to clamp sweeping federal controls on the oil and natural gas industries as a result of what he claims are "unwarranted" price hikes in gasoline and other petroleum products.

The Heselton measure—which is not likely to be acted upon next year, any more than this year—would set up an 11-member National Petroleum Commission, replacing FPC and having the power to impose rigid price controls on gasoline, fuel oil, natural gas, and kindred products. The measure would

Thermally Thinking

give the commission power to "regulate production, refining, distribution, and sale of petroleum and petroleum products, including natural gas, as it should deem necessary for the protection of the national security and economy."

Mr. Heselton himself is a member of the powerful House Committee on Interstate and Foreign Commerce, but he is not nearly as important as he thinks he is. Also, the committee isn't even about to act on his bill. He has taken an active interest in natural gas and other related fields since the New England territory started toward getting natural gas service through long pipeline. First, he became an authority on pipeline safety and won quite a bit of publicity. Now, he likely will endear himself to groups in his district by this new bill.

While action is not likely any time soon, the Heselton move *is* significant for this reason. Many Republicans on Capitol Hill are beginning to get restive under the perennial propaganda needlings of the Democrats, who have labeled the Republicans successfully as the "giveaway" party—at least, a party that allegedly gives away the national rights to "selfish interests." Mr. Heselton is a politician who keeps his finger in the air to see how the political winds are blowing. He is a good friend of Sherman Adams, of New Hampshire, who is alleged to be the man closest to President Eisenhower in the White House entourage. It isn't likely that Mr. Heselton would make a move without consulting Mr. Adams.

Intrastate distributors may win freedom from FPC

The Hinshaw bill (HR 5976), conceived to overthrow the Supreme Court's decision in the East Ohio case (in which East Ohio, operating entirely within a single state, was declared subject to FPC rules since it received interstate gas at the border), has made an auspicious start. Favorably reported out of the House Committee on Interstate and Foreign Commerce July 16, it had the blessing of—had even been partly written by—FPC. Only Commissioner Doty was "not in full accord."

Text of the bill, with FPC changes in italics, is as follows:

"(c) The provisions of this act shall not apply to any person engaged in or legally authorized to engage in the transportation in interstate commerce or the sale in interstate commerce for resale, of natural gas received by such person from another person within or at the boundary of a state *if all of the natural gas so received is* ultimately consumed within such state, or to any facilities used by such person for such transportation or sale, provided *that the rate and service of* such person and facilities be subject to regulation by a state commission. The matters exempted from the provisions of this act by this subsection are hereby declared to be matters primarily of local concern and subject to regulation by the several states. A certification from such state commission to the Federal Power Commission that such state commission has regulatory jurisdiction over *rates and service of* such person and facilities and is exercising such jurisdiction shall constitute conclusive evidence of such regulatory power or jurisdiction."

Wanted: more work

The Gas Industry Advisory Council, in its latest meeting with Petroleum Administration for Defense officials, indicated it wants more work and more authority. Specifically, the council really discussed only one thing—getting Secretary of the Interior Douglas McKay to allow it to be reorganized as an all-industry group, with a permanent secretary of its own.

Heretofore, the council has operated inside the framework of the federal emergency controls agencies, specifically PAD. While it is composed mostly of gas industry representatives, nevertheless it has been headed by Oscar W. Morton, PAD's acting assistant deputy administrator for gas transmission and distribution.

The council approved a resolution calling on Secretary McKay to reorganize it along the lines of the National Petroleum Council, which is composed entirely of oil industry members and works as an advisory group to Uncle Sam. The NPC is the only organization of its kind, being a non-government agency financed by the industry.

Mr. Morton told reporters, after the council meeting here, that the gas industry advisory group "does not feel it has done as good a job as it could have done" because "a limitation has been placed on the council by the Department of Justice's attitude toward such groups," and the council wants the Secretary to know this.

A Department of Justice ruling, made long before the present administration took over, purportedly prevented "collusion" by requiring such committees working directly within defense agencies to be headed by a full-time federal official. It may have also prevented agreement.

$5 billion for gas and oil

From June 11, 1951, to July 1, 1953, the Petroleum Administration for Defense approved applications to build or to complete oil and gas projects valued at $5,785,254,497, officials have announced here.

Applications for approval of facilities worth another $1,076,314,740 were denied, canceled, deferred, or returned without action. Over the period of a little more than two years in which the agency processed PAD-26 forms, officials received 7025 original cases and 2319 amendments. A total of 6349 original cases and 2189 amendments was approved.

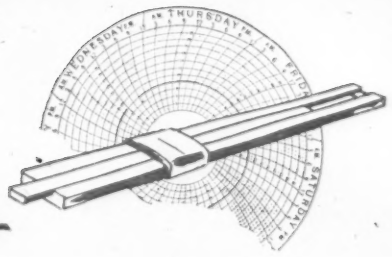
Following are the total values of original cases and amendments approved by each of the PAD divisions:

Gas	$2,392,965,696
Refining	1,619,527,898
Supply and transportation	1,244,851,953
Natural gas production and processing	437,301,276
Marketing and distribution	25,895,588
Production	64,712,086

These figures do not necessarily cover *all* of the expansion initiated by oil and gas industries over the more-than-two-year period, since some operators did not require priorities assis-

Continued on page 48

Technical Trends



• By GUY CORFIELD

Radiant glass heating panels

It is always interesting and instructive to study our competition, particularly when we have available information from such an authoritative source as the National Bureau of Standards. This bureau has recently conducted comparative tests, in a 1-story, 4-room-and-bath test bungalow, of radiant glass panels vs. a forced air heating system with baseboard registers. A total of 10 glass panels were installed under windows in the various rooms. They were of conventional design whereby an electrically conductive coating is applied to the rear side of the glass, which is mounted in a metal frame backed by a reflective shield, with provision for air circulation between the glass and the shield, and the shield and the frame. Heating is by direct radiation from the glass, and by convection by the circulating air through the assembly and up across the front of the glass. The output per panel was rated at 1000 watts at 230 volts but was actually 820 watts because of lower local voltage. The heat loss of the bungalow was 8.33 kw when uninsulated, and 5.18 kw when insulated, at an outside temperature of 0° F.

The report of this test, as written in the NBS *Technical News Bulletin* of May 1953, does not go into great detail, but the results are indicated in statements such as the following:

". . . electrically heated radiant glass panels constitute a satisfactory method of warming a basementless house. However, even with the house thoroughly insulated, electric heating can be expected to entail higher annual heating costs in most areas than would coal, oil, or gas, because useful heat derived from electricity has a higher unit cost than produced from these common fuels.

"The initial power demand from the panels was about 145% of the steady demand after the panels became thoroughly heated. The panels required approximately 20 minutes after starting to attain a steady power demand and approximately 30 minutes to attain a steady temperature on their exposed glass surfaces. The temperatures at the centers of the glass plates operating at rated voltage averaged about 340° F.

"The vertical temperature differences in the living zone with the radiant glass panels were about 1° to 2° F greater than those observed in the same house with a baseboard convector heating system. Insulating the walls and adding storm windows did not significantly change the vertical temperature differences observed in this house.

"The radiant panels in the uninsulated bungalow were compared under identical conditions with a forced warm-air heating system, using baseboard registers, the vanes of which directed the warm air down at the floor. Comparison showed the radiant system provided more radiant energy at the 30-in. level and more comfort at the floor level.

". . . it appears that in the insulated house, when all 10 panels are utilized, one hour is required to raise the room temperatures from 65° to 70° F at an outside temperature of 0° F.

"Analysis of the tests indicated that compensated room thermostats with very low differential that produce rapid cycling of the heating units are desirable with the radiant glass heating panels. This would provide a continuous emission of radiant heat since the cessation of radiation between heating cycles was quite noticeable when the 'off' period was of long duration. Also a control device for the system, which would permit heating of the house to a comfortable level at design outdoor temperature, but which would limit the electric power demand to a value approximately equivalent to the design heat-loss rate, is desirable from the standpoint of both the consumer and the utility company."

Remote control of machinery

Recent gas industry technical papers and magazine articles have described many installations of remote observation, supervision and control of regulators, valves, compressors, etc., achieved in a variety of ways. Some other industries are, of course, equally ingenious in this respect, and the design of the Boise City oil products line booster pumping station, on the Borger-Denver line, has some interesting features.

This station, consisting essentially of two 100-hp vertical oil pumps, is completely unattended, and controlled from a point 62.3 miles distant through a telephone dialing system. The station includes within itself certain safety devices to take care of low or high pressure, circulating lube oil loss, etc., but the interesting features are the information and control obtainable through simple telephone dialing and listening to the dial tone. Five dial numbers or codes are used, as follows:

1. To monitor the lube oil level. The dial tone will be interrupted if the oil level is satisfactory and steady if it is low. On dialing this number, a telephone relay is activated, and this relay in turn energizes a mechanically-held relay which actuates the combination magnetic starter and control transformer. This in turn energizes the discharge and suction pressure switches and the time delay relays for both units, as well as the magnetic switch for indicating seal or diaphragm failure or circulating oil loss, and oil level indicator.
2. To start both units. The first pump starts with a time delay of 30 seconds and the second with a delay of 180 seconds.
3. To monitor the first unit. The dial tone will be interrupted if the unit is operating and steady if it is not.
4. To monitor the second unit.
5. To stop both units.

This pumping station has been operating satisfactorily for more than a year, and is normally visited and inspected only once a month. The rental cost of the telephone equipment is less than would be the normal expense of maintaining an engineer-attendant.

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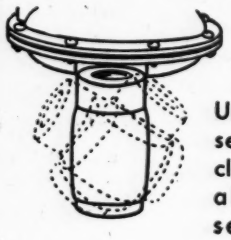

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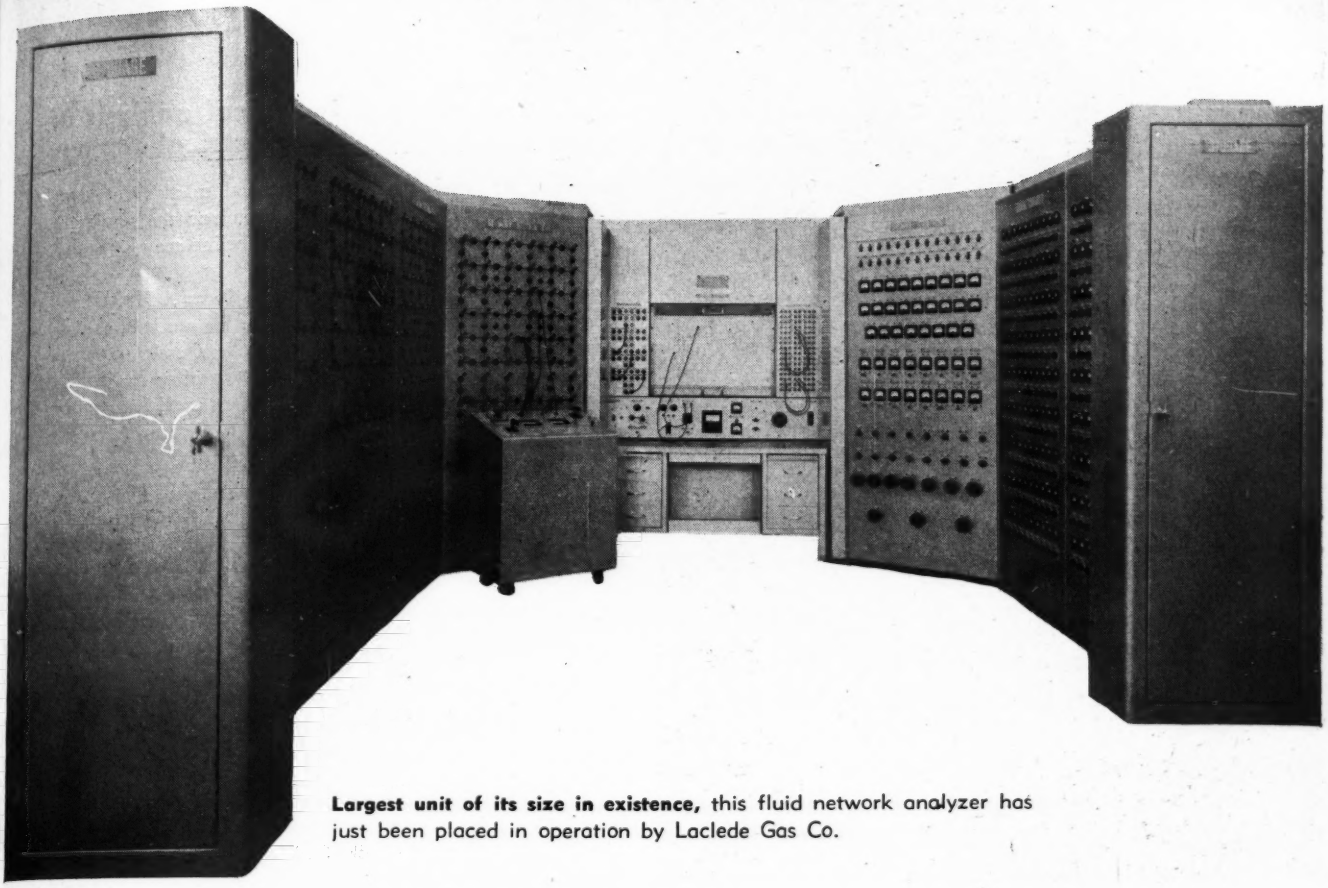


Largest unit of its size in existence, this fluid network analyzer has just been placed in operation by Laclede Gas Co.

Laclede's new network analyzer starts attacking distribution layout problems

By **FRANK CHAPMAN** • Feature Editor

GAS staff report

THE first analogue computer designed and built especially for the analysis of gas distribution problems has recently been put into use by the Laclede Gas Co. of St. Louis. The equipment, known as the McIlroy fluid network analyzer, was made by the Standard Electric Time Co. of Springfield, Mass., and, with its capacity of 491 mains, 180 loads, and 26 sources, is the largest unit of its kind in existence. It makes use of the analogous relationship between the flow of fluid in a pipeline and the flow of electric current through a non-linear resistor to provide a quick and accurate prediction of the physical performance of the gas line network.

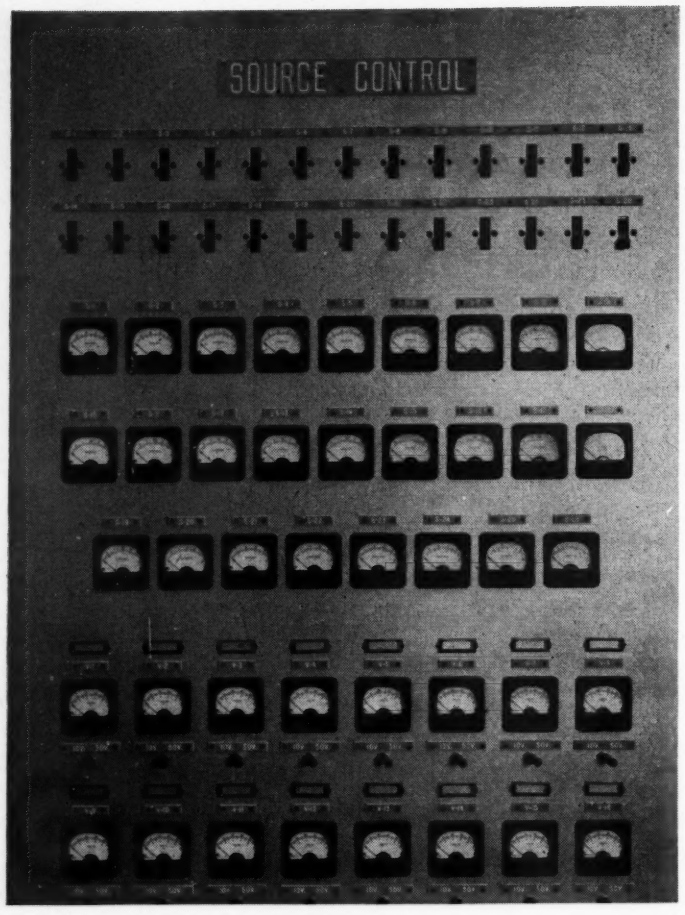
The McIlroy instrument employs a type of non-linear resistor known as a Fluistor, which is available in approximately 200 values. Since one value of head loss coefficient may apply to a number of combinations of length, diameter, and condition of pipe, a single Fluistor may be used to represent a great variety of pipes.

The pipeline network problem is set up on a grid-like panel with the respective sections of pipe in the system represented by appropriately selected Fluistors. The Fluistors are mounted in receptacles which are permanently wired into the panel. Another part of the equipment provides a position for a map of the section under study. Direct readings of the pressure drop and fluid flow may be taken from this position.

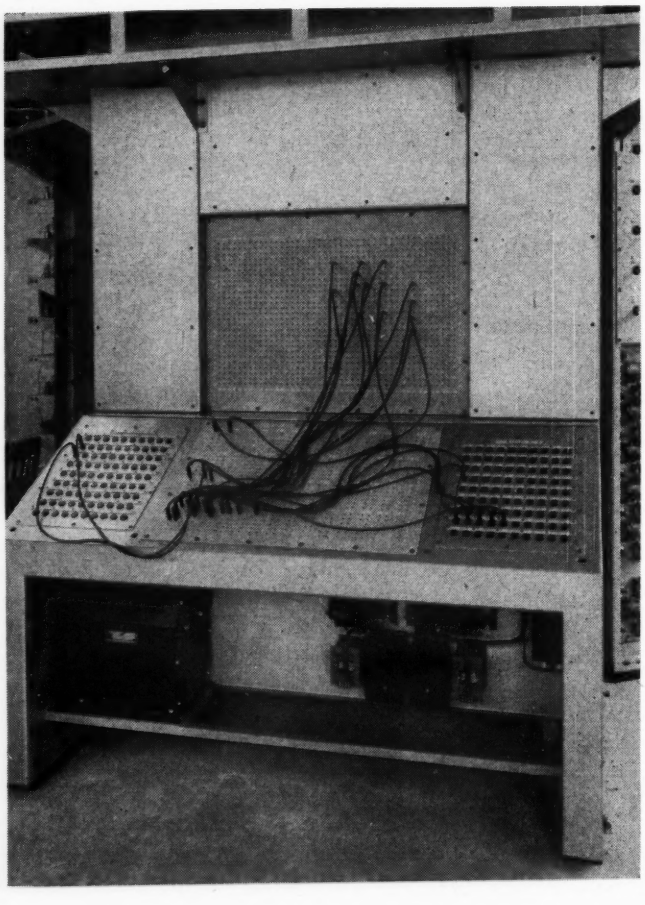
Because of the non-linear characteristic of the Fluistor, values of flow rates and pressure or head loss are read directly in gas units without conversion from electrical units. Space is also provided on the equipment for semi-automatic and automatic devices which represent loads and supply sources.

The analogous application of current flow in an electric circuit as a method of determining distribution of flows and pressure losses in a gas line network is not a new one. In fact, the basic laws of electric current flow have long been used in various ways to provide an analogous relationship to the general laws which govern the operation of a line network.

These laws for an electric current state that the sum of all currents approaching any given terminal is exactly equal to the sum of all currents leaving the terminal, and that the sum of all voltage drops taken clockwise around any network loop is equal to the sum of all voltage drops taken counterclockwise around the same network loop. Since the flow of fluid in a gas line network obeys



Portion of the source control panel where current and voltage readings are taken to indicate the supply source applied to the network under study. Each of the meters is wired into the system to read voltage and current to one of the network sections.



Rear of the control section panel where network terminals for the problem under study are patched into the remainder of the equipment. Load section panels are shown on each side of the sloping table. Voltage regulator and rectifying equipment can be seen under the table top.

*Technical analysis of the electrical analogy

The general relationship between pressure drop and the rate of fluid flow in a pipeline may be expressed in the form,

$$P_1 - P_2 = A\ Kp\ Q^n,$$

where P_1 and P_2 are inlet and outlet pressures, A is a scale factor based upon the system of units used, Kp is the pipeline loss coefficient which depends upon the dimensions and condition of the pipe, Q is the flow rate, and the exponent n is a variable, the value of which depends upon the velocity of fluid flow and varies between 1.7 and 2. In the formula of Spitzglass and others the value of the exponent n is often taken as 2. Hence these formulae are called square law relations. Darcy's law has been used to state this relationship more accurately in which the friction factor is a function of Reynolds number and the roughness of the pipe. The Hazen-Williams formula, widely used in the analysis of water supply network problems, can be written to make the head loss proportional to the 1.85 power of the flow rate. However, the various formulae that express this relationship can be made to agree, within the required tolerance, by assuming the flow as given by any one of them to be correct for a given head loss. The constants can then be chosen in the selection of Fluistors so that the flow indicated by the Fluistor is equal to that of the formula.

The electrical analogue of the relationship between flow rate and pressure drop may be expressed as,

$$E = k\ I^n,$$

the Ohm's law equivalent of the head loss-fluid flow relationship, where E is the voltage drop across the resistor (the equivalent of pressure drop along the pipeline), k is the coefficient of the resistor (equivalent to the loss coefficient incorporating its scale factor A of the pipeline), I is the current through the resistor (the equivalent of fluid flow in the pipeline), and the exponent n expresses the non-linearity of fluid flow in the resistive element. For a Fluistor this relationship is expressed electrically as $E = k\ I^{1.85}$, and in terms of fluid flow as $P_1 - P_2 = A\ Kp\ Q^{1.85}$. The terms A and Kp when multiplied together give K which is the coefficient of the Fluistor.

these general laws, an array of suitable resistors interconnected according to a map of the pipeline network can be used to represent the network.

Distribution system calculators based upon this principle of operation have been used extensively in the design of gas, water, steam, and electric distribution systems. In the design of electric power distribution systems the results obtained from the calculator may be applied directly to the actual problem because voltage drop due to the resistance of the wire distribution system varies in the same linear fashion as does voltage drop in a resistor. However, in the solution of pipeline network problems this condition does not exist because pressure drop along the line is a non-linear function of the rate of fluid flow. Therefore, equipment making use of variable linear resistors must make provision for a suitable conversion to accommodate this non-linearity in a pipeline system. Although linear resistors will provide a satisfactory answer that is direct reading for any one value of fluid flow, a somewhat laborious process of successive approximation is required to determine pressure drop for any change in the rate of flow. These procedures are not necessary when a non-linear resistor element, such as a Fluistor, is used.

The Fluistor

The Fluistor, which is the heart of the McIlroy unit, consists of a tungsten filament mounted in an evacuated glass bulb, and resembles an ordinary showcase type incandescent lamp. Its non-linearity is such that the voltage drop across its terminals automatically varies as the 1.85 power of the current through it, and results from the physical dimensions of the filament and supporting leads. Since, in a fluid flow system, resistance to flow depends upon flow rate, so flow rate is non-linearly related to pressure drop. This relationship has been variously expressed as a square law function by Spitzglass and others and, when the Reynolds number relationship is used, as a function of the flow rate to a power lying in the range between 1.75 and 1.85.* Therefore, a Fluistor of the proper coefficient can be made to simulate a pipe of any length and diameter in a network, with the voltage across its terminals being equal to the pressure drop in the pipe for all values of flow.

The first step in making a network analysis is the preparation of a skeletonized network showing length and diameter of all pipeline sections in the system, load flows, and points at which gas is supplied to the network. A value of loss coefficient for each of the pipeline sections must be found by multiplying the pipe length in thousands of feet by the coefficient which represents the diameter. In order to relate gas units to the analogous electrical units it is necessary to apply a conversion factor to each value of loss coefficient. This value is entered on the network chart in its proper location, and is used in the selection of a Fluistor for each of the pipeline sections.

After the network of Fluistors has been set up on the panel, automatic load units are connected into the circuit as indicated on the network map. These load devices will hold the load current constant over a large range of network voltages. The adaptability of the Laclede installation is indicated by the fact that a total of 180 loads may be applied to a network problem. Metering equipment is provided for each of the loads.

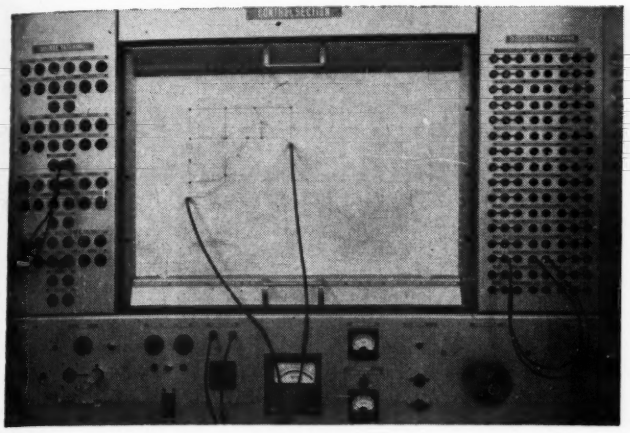
Source current added

Source currents are added at points in the network which simulate the sources in the distribution system. If these source are at different elevations and pressures they can be set up accordingly on the panel. The Laclede installation provides for a total of 26 direct current sources. Each of the sources is controlled from a separate rheostat.

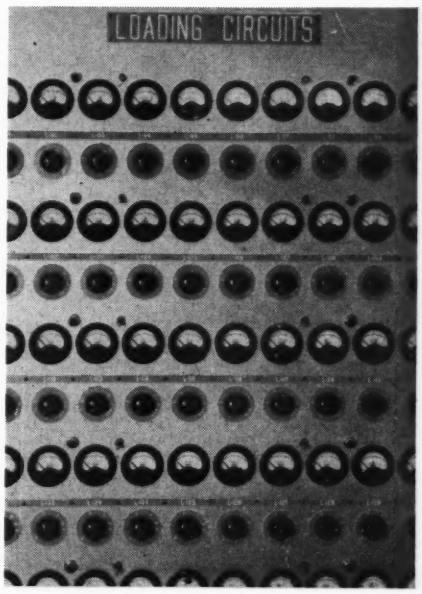
In making the analysis after the equipment has been properly set up, pressure drop between any two points in the network may be read directly from the analyzer by connecting a voltmeter across designated points on the panel board. Flow rates are read on an ammeter by connecting it in series with the respective pipeline section shown on panel.

The McIlroy analyzer was invented by Malcolm S. McIlroy, professor of electrical engineering at Cornell university and consultant to the Standard Electric Time Co.

Two other McIlroy units, both smaller than the Laclede instrument, are in existence. One is located at the State College of Washington at Pullman, Wash., and the other is located at the Midwest Research Laboratories in Kansas City, Mo. Both of these units have been used extensively in handling network analysis problems.



A section of the loading circuit metering panel showing meters which indicate the amount of current drawn by each of the loaded terminals in the network. A total of 180 loads are provided in the analyzer.

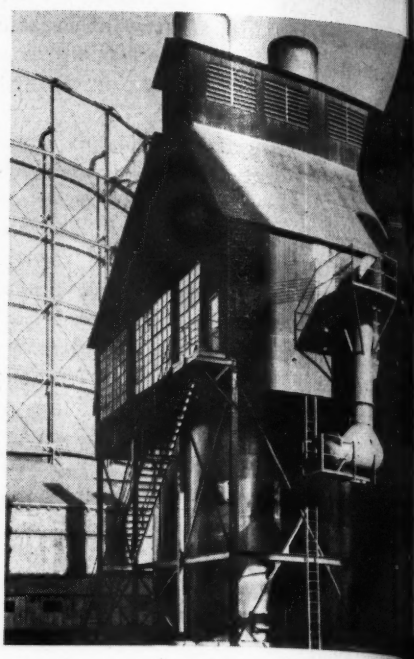


The control section of the McIlroy analyzer showing method by which readings of pressure drop between any two points may be taken directly from a map of the pipeline section under study. Patch cords are used to plug directly into the various terminals in the network. Panels on each side of the map mounting board provide for source and intersource patching arrangements to conform to the problems.

*See technical analysis on opposite page.

How Baltimore helped develop the high-Btu oil gas process

• By C. E. UTERMOHLE
Consolidated Gas Electric Light & Power Co., Baltimore



Exterior view of the Hall high-Btu oil gas set erected in 1949.

OUR interest in the production of high Btu oil gas began in 1946 when the Baltimore refinery of the Continental Oil Co. was shut down. We had been purchasing oil gas from this refinery for approximately 16 years and when this supply was discontinued we began to study possible methods of producing high Btu gas to use for the enrichment of the blast furnace gas which we purchased (along with coke oven gas) from the local plant of the Bethlehem Steel Co.

At this time Edwin L. Hall proposed a novel idea to the American Gas Assn. gas production research committee which ultimately led to the development of the Hall high-Btu oil gas process. Our company was selected to develop this process because of our interest in high-Btu gas and because we were able to provide adequate facilities and technical personnel for the work. The first Hall set was made by the conversion of two existing carburetted water gas sets in the summer of 1947. The set was put into operation in October of that year.

Second conversion

At the same time we undertook the conversion of another water gas set to the twin or parallel generator type of oil gas set. This set was put into operation in December 1947.

Our work in connection with oil gas production was given an added stimulus by developments which indicated that natural gas would soon be available in the Baltimore area. Economic studies indicated the advisability of distributing straight natural gas and using oil gas for peak shaving and standby in the event of a curtailment of the natural gas supply.

We operated both oil gas sets throughout the winter using an oil having a Conradson carbon content of approximately 6%. This was the type of oil which we normally had used for the production of carburetted water gas and we have used similar oil for all oil gas that we have produced either on the Hall or the parallel generator type of sets. We have only used gas oil for short periods for experimental studies. We were probably the first plant to use heavy oil in parallel generator sets.

During the summer of 1948 we operated the Hall set with various grades of oil ranging from diesel oil to Bunker "C" oil and the parallel generator set on oils ranging from diesel oil to oil having approximately 6% Conradson carbon.* The tests indicated that the Hall set is 5% more efficient than the parallel generator set when using the 6% Conradson carbon oil and is 3% more efficient when using gas oil. This is because the regenerative effect of the Hall cycle results in lower stack losses and because when using 6% Conradson carbon oil, the parallel generator sets must be shut down every 8 to 10 hours of operation to burn off carbon accumulation. Approximately one hour is required to scurf off the carbon under forced draft.

Our test work was followed in 1949 by the construction of a completely new 4-shell Hall set having an external diameter of 13 ft and a capacity approximately 50% greater than the first Hall set. Thus in 1950, before conversion to natural gas, we had 19 12-ft carburetted water gas sets, one parallel generator oil gas set, and two Hall Process oil gas sets. These sets had a total sustained capacity of 102 MMcf of 500 Btu gas per day.

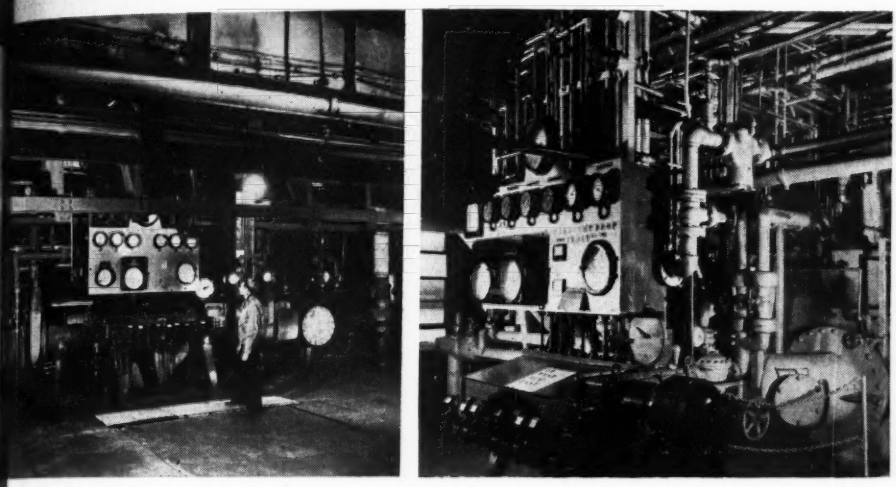
Parallel generator

Before the conversion it had been determined that the parallel generator type oil gas set could be operated satisfactorily with 6% Conradson carbon oil for peak shaving purposes. Since the plant was also to be used to "back up" the natural gas supply in event of failure, and since we already had two Hall sets capable of producing the peak shaving gas on all but the coldest days, 18 of the 19 carburetted water gas sets were converted to parallel generator type sets to obtain maximum plant capacity. The 19th water gas set was converted to a series generator 3-shell set with reversed blast. With this arrangement we now have for peak shaving a daily capacity of 67 MMcf when using a 6% Conrad-

*Complete results of these tests, which were sponsored by the AGA, were reported in the February 1949 issue of the *AGA Monthly* and AGA Research Bulletin (Project HB1) Winter, 1948-49.

son carbon oil or a daily capacity of 101 MMcf for emergency operation when using gas oil.

Thus, the effect of conversion of the plant to high-Btu oil gas processes has been to double the thermal capacity of our gas generating equipment. However, our facilities for handling oil and for tar processing required enormous increases. Our oil handling capacity, which was 450,000 gal. per day before conversion, is now 1.4 million gal. per day. Our tar dehydrating capacity was increased from 100,000 gal. of dry tar per day to 250,000 gal. per day by the installation of additional heat treating equipment. These are very important factors which must not be overlooked if maximum capacity of generating equipment is to be realized.



At left is the original high-Btu gas set. The carburetors and superheaters of two existing carburetted water gas sets were combined in 1947 to make this unit on which original tests were run. At right is the Hall high Btu oil gas set with four 13-ft OD diameter shells. It was installed in 1949.

The substitutability of oil gas for natural gas has been a subject of considerable study both before and after our conversion to natural gas. As was expected, our tests showed that the lowest gravity oil gases were more substitutable than the higher gravity gases because the Btu input to the burner more closely approached that obtained with natural gas. The gases produced during the AGA tests in 1948 were all above .800 sp gr and contained approximately 20% inerts. Extensive tests were made to determine what changes could be effected in the quality of the oil gas produced and thus improve its substitutability by the use of different oils and by changes in cycle and cracking conditions.

The production of lower specific gravity oil gas requires:

1. Operation of the set so as to reduce the inert content to a minimum and
2. Greater severity of cracking of the oil so as to produce a lower Btu inert-free oil gas and thus maintain the Btu of the finished gas constant.

Inerts in the finished gas result from:

1. Blast products that remain in the set at the end of the heating period and are carried into the washbox at the beginning of the make period, and
2. The combustion products which are put into the washbox during the blow purge period when the air blast valves are open prior to opening the stack for the heating period.

In order to remove the combustion products from the set at the end of the heating period we altered our cycle so that steam purges through the set for approximately seven seconds after the blast valves are closed and before the stack valve closes. With this setting, smoky steam is just starting to emerge from the stack as the stack valve closes. This is the maximum purge that can be allowed without discharging smoke and losing an excessive period of each cycle for purging.

Reduction in inerts resulting from blow purge was not as easy to attain, particularly with the heavy oil operation which we used on all sets. The primary purpose of our use of blow purge when we first experimented with oil gas production was to eliminate the smoke puff which was discharged from the stack at the beginning of the blow period.

During the blow purge period, vaporization and combustion of the heavy residues remaining in the checkerbrick occurs. In order to reduce the blow purge time without objectionable smoke puffs, the quantity of heavy residues remaining on the checkers at the end of the gas making period must be reduced. These residues remain on the checkers because they have been cooled too much (1) by introducing too much oil per cycle, (2) by uneven distribution of the oil which results in overcooling some portion of the checkers or (3) by improper atomization of the oil.

We made several changes to improve each of the three conditions. We reduced the length of the cycle from four minutes to three minutes and we recently have made a further reduction on some sets of 2½ minutes. Each reduction in cycle time has resulted in reduction in the smoke puff even though the hourly capacity of the set was maintained constant. The oil sprays used originally had five atomizing nozzles and uneven distribution occurred because the inner semi-circle of each spray was directed near the center of the checkers where the area of the checkerbrick is the least. The impingement of the inner portion of the jets on each other resulted in the formation of larger droplets which destroyed the effect of the original atomization.

Single nozzle spray

In order to obtain uniform oil distribution and good atomization we developed with the cooperation of the Anthony Spray Co. a single nozzle spray which distributes the bulk of the oil near the walls of the generators where the area of checkerbrick is greatest and where the radiation from the sidewalls is most effective in aiding vaporization. We have found it desirable to test each spray nozzle purchased before installation by use of a jig where the nozzle is suspended the same distance above the ground as the spray is normally above the top course of checkers. The spray is supplied with high pressure water and distribution observed on the ground where a circle is drawn with the same diameter as the generator. Slight alterations are made in the nozzle dimensions by our machinists until the distribution is considered satisfactory.

During our first few years of experience with oil gas operation we used a blow purge of approximately 15 seconds to control smoke but after making the various improvements mentioned above, we can now operate with approximately

3-second blow purge without excessive smoke. The three seconds is just about sufficient with the air rate we use to displace the steam and any gases left in the set at the end of the make period. Therefore, very little combustion products enter the washbox as a result of blow purge.

The steam purge at the end of the heating period and the reduction in blow purge have enabled us to reduce the inert content of the finished gas from 20% to between 5% and 7%. Complete purges of an oil gas set cannot be attained because of the turbulent flow which exists in the checkerbrick.

As mentioned before, if the same finished gas Btu is to be attained, the severity of cracking must be increased as the inert content is reduced. In the laboratory practically any inert-free heating value can be produced from any oil. However, this cannot be done in a gas plant because the condition of the tar produced is a very important factor. Undercracking an oil results in large quantities of unsulfonated residue or uncracked oil in the tar. This causes emulsion to float in the separating pits, makes dehydration of emulsion difficult and adversely affects market value of the tar. Overcracking results in large quantities of free carbon in the tar, produces a tar of high viscosity which is difficult to handle and an emulsion which is difficult to dehydrate, and adversely affects the market value of the tar.

Cracking conditions

Therefore, for any particular oil, the cracking conditions must be adjusted to produce a tar which can be handled and the finished gas heating value adjusted by control of the inert content.

With the heavy oils we have tested, it appears that the inert-free oil gas heating value can be varied within a range of approximately 100 Btu while producing a tar that can be handled. This range is from 1250 Btu to 1350 Btu (approximately 100° F change in average cracking temperature) for the 6% Conradson carbon oils which we have used. We have produced an inert-free gas having a heating value of 1200 Btu for short periods with these oils but the tar was very difficult to handle. The upper Btu limit for the gas oils and diesel oils which we have tested is approximately 1250 Btu.

We have not explored the lower limit for these lighter oils but believe that a Btu at least as low as 1050 can be produced satisfactorily. These figures show that if a 6% Conradson carbon oil is being used, producing a 1050 Btu finished gas, the inert content of the gas must be between 15% and 22%. However, when using the lighter oils the inert content can be between 0% and 15%.

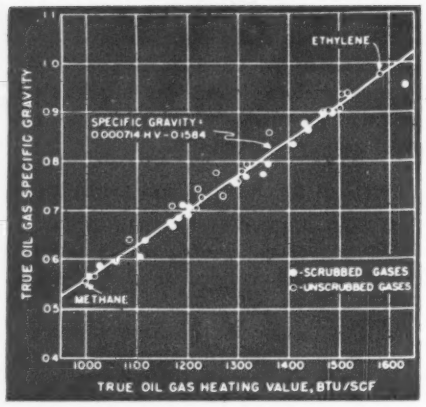


Fig. 1. Relationship of composition and true oil gas heating value.

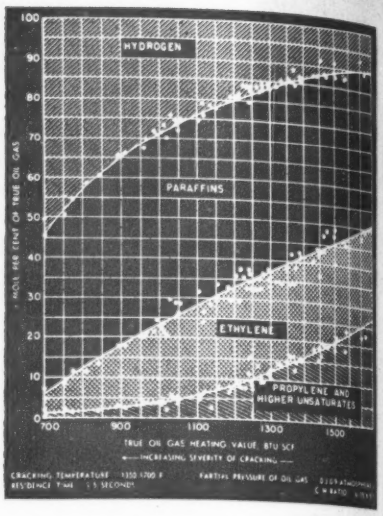


Fig. 2. Relationship of heating value and specific gravity of oil gases.

Inability to purge

Actually, we have not been able to produce gas having less than 5% inerts because of inability to purge the set completely. This indicates that the light oils will produce the gas that is most substitutable for natural gas. This is a fortuitous gain since it is desirable to be able to obtain the maximum productive capacity and the maximum substitutability at the same time to meet emergencies resulting from interruption of the natural gas supply. All of the heating values listed above are for scrubbed gas. Heating values for unscrubbed gas would be approximately 50 Btu higher.

The production of oil gas requires more careful control of cracking temperatures than most operators are accustomed to using in water gas operation. The heating value of the oil gas will vary by approximately 1 Btu for each 1° F change in cracking temperature. As an aid in establishing uniform cracking conditions in all gas machines operating, we check the condition of the tar produced by allowing a gas sample from a gas connection at the top of the superheater to impinge on a piece of tin. The condensed tar is then checked to determine the cracking condition. If the deposit feels slippery, undercracking is indicated and if the deposit is dry and dull overcracking is indicated. Between these two extremes the deposit will have varying degrees of stickiness.

Our tests have confirmed on a plant scale some of the conclusions reached by the Institute of Gas Technology in research on oil gas production methods and interchangeability under the direction of Dr. H. R. Linden. The institute's data showed that the composition and specific gravity of oil gas produced from any oil would be approximately the same if the inert-free oil gas heating value were the same. It also showed no appreciable change as a result of variations in contact time or steam atmosphere for partial pressures encountered in existing oil gas sets.

Btu of true oil gas

In the interim report, "Interchangeability of Oil Gas and Natural Gas" published by IGT in May 1952, a graph is plotted showing the relationship between Btu and specific gravity of true (inert-free) oil gas. This is shown in *Fig. 2*. Using the equation of this relationship, we have calculated and plotted data by which we can determine the Btu of the true oil gas and the inert content of the finished gas if the heating value and specific gravity of the finished gas are known. These data are shown in *Fig. 3*. In calculating the data for this graph we used a specific gravity of 1.06 for combustion products (CO_2, O_2 and N_2) and assumed that the finished gas would contain approximately 1.5% CO.

After the true heating value of the oil gas has been determined from this chart, the analysis of the true oil gas can be determined from another chart which appears in the IGT publication as shown in *Fig. 1*. Using the data from this chart and the inert content from *Fig. 3*, a finished gas analysis can be calculated. All

of these data are available by the use of routine determinations of heating value and specific gravity. While this method may not be relied on for any special test work, it serves as a very useful guide for operations on a day-to-day basis without performing difficult analyses.

The quantity of unsulfonated residue or free carbon in the tar is not only a function of the average intensity of cracking but also is a function of the extremes of temperature to which the oil is exposed. Excessive variations in temperature result from the introduction of too many gallons of oil per cycle, i.e., the use of too long a cycle, or from uneven distribution of heat in the checkers from improper burner operation, or introduction of air in a manner that promotes channeling. It is possible to have such extremes in temperature that the tar will contain large amounts of free carbon and have a high unsulfonated residue at the same time.

Air supplied tangentially

The air blast connections on all of our sets are arranged so that the air is supplied tangentially to the tee on top of the shell. In addition to the tangential connection we have found it desirable to place a semi-circular baffle in the 24-in. air line at the side of the line toward the center of the shell so that the air is supplied tangentially and at a high velocity to cause a rotating flow around the burner. This permits higher combustion rates and results in more even distribution of combustion products and therefore of heat through the checkers.

In order to supply the greatest possible amount of heat to the top courses of checkers where it is needed to vaporize the make oil, and to avoid overheating the superheater, it is necessary that the heating burner operate with a short flame so that combustion is substantially completed in the space above the generator checkers. When the grates were removed from our former water gas sets, we extended the shells of 10 sets from the clinker floor level to ground level, a distance of approximately 8 ft, to obtain the maximum space above the checkers for combustion and to obtain maximum possible vaporization of make oil from side wall radiation.

Failure of generator checkers by spalling due to heat shock has been a problem in most oil gas installations. Thermal shock is reduced by shorter cycles, better heat distribution and better make oil atomization and distribution. We used six courses of silicon carbide checkers and one course of clay checkers (on the bottom) in each generator of our 4-shell Hall sets for several years. However, our experience indicated that depth of checkers in the generators had little effect because all of the heat for vaporization is released in the top few courses. The oil handling capacity of a generator is primarily dependent on the cross-sectioned area which determines the number of brick in the top course exposed to the initial impingement of the oil. Therefore, we have reduced the number of courses of checkerbrick to two courses of silicon carbide and one course of clay. We have noted no change in operation of the set.

During the past two years we have experimented with the use of Amine 220 to aid in the dehydration of tar. We have obtained the greatest success with this material by adding it to the circulating water being pumped to the washbox rather than to the emulsion after it has been formed. Tests on a small scale in the summer of 1951 indicated that the water content of the emulsion in our separators could be reduced to approximately 30% instead of the 70% water content emulsion normally produced. On the basis of these tests we installed a small chemical proportioning pump to supply the Amine 220 to the discharge of the circulating water pump.

During the last 15 days of January 1951 we produced approximately 1 million gal. of dry tar and added 88 gal. of Amine 220 to the water going to the washboxes. At the beginning of the 15-day period the water content of the emulsion was approximately 40% and by the end of the period the water content of the untreated tar had dropped to less than 10%. A review of dehydrating costs indicates that by the use of approximately $600 worth of Amine 220 we saved $1800 in the cost of steam used for dehydration, and in addition gained advantages in reduction in labor required and an increase in dehydrating capacity obtained.

Mild winter

During the past winter we produced very little peak shaving gas because the weather was very mild. However, whenever we have operated, we have added Amine 220 by use of the chemical proportioning pump and maintained the surface tension of the water being pumped to the washbox at approximately 50 dynes per cm. We determine the surface tension of the water with a Cenco DuNouy tensiometer. The emulsion produced contained 10% to 15% water and no heat treatment was required other than final distillation of light oils and water. Considerable information concerning this method of tar handling is published in another Institute of Gas Technology report entitled "Prevention and Resolution of Tar Emulsions in High Btu Oil Gas Production," published in January 1953.

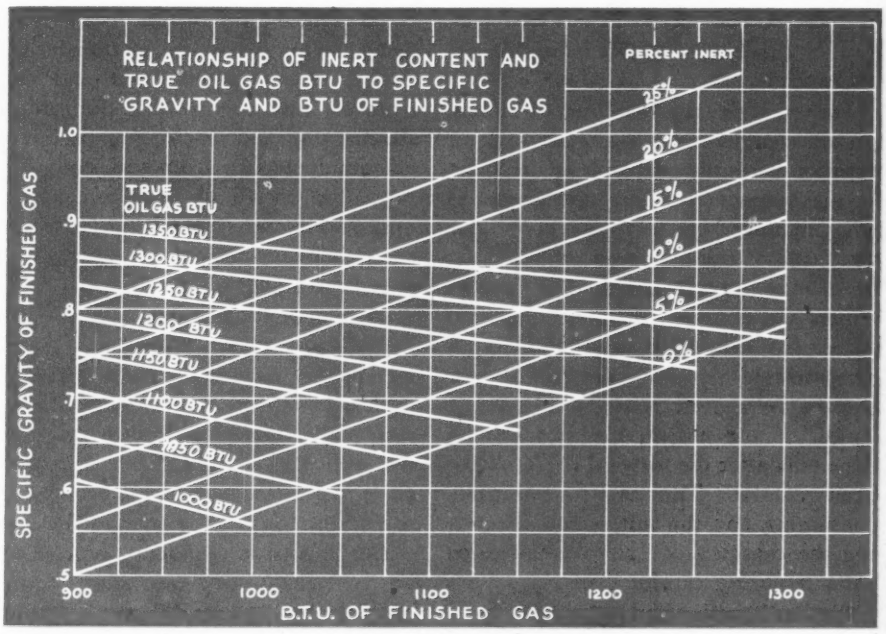


Fig. 3. Relationship of inert content and true oil gas Btu to specific gravity and Btu of finished gas.

This article is adapted from a paper presented at a meeting of the operating section of the NEGA in Providence, R. I., in May.

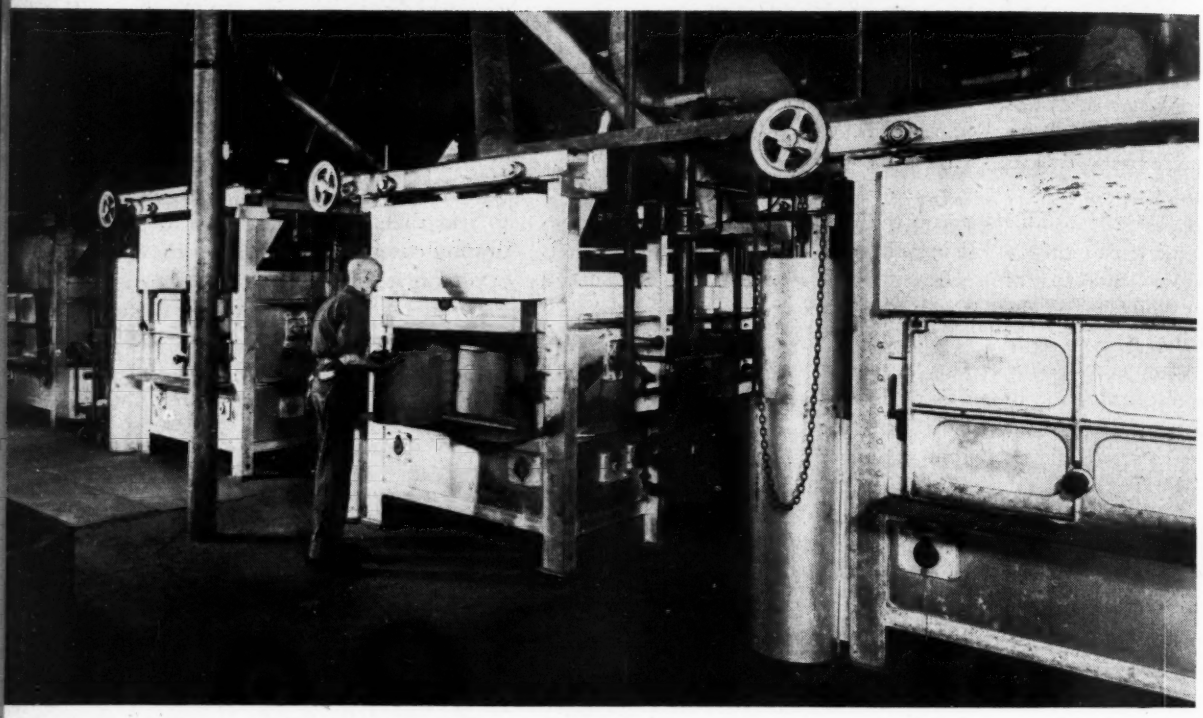


Fig. 1. Charging one of the direct gas-fired double-end furnaces with saggers containing formed carbon parts.

Long-cycle heat treating of carbon graphite parts achieved in double-end gas fired batch furnaces

HEAT treatments involving long cycles and volume production, such as those required for carbon-graphite parts, pose devious problems of material handling, accurate control of heat cycles, and most efficient load pattern, especially if the parts being treated are small.

For example, the handling of closely packed charges requiring cycles of long duration is readily adaptable to the static in-the-furnace handling characteristics inherent in the batch-type or in-and-out box furnace. But here is encountered the problem of multiple handling of the containers and efficient utilization of hearth space. Not only must the containers located toward the rear of a single door furnace be moved across the entire length of the hearth, but this can be done only after the forward charges have been removed. This can prove time-consuming and difficult, especially during the charging of fragile untreated parts requiring careful handling.

Similar handling and production problems were encountered by the United States Graphite Co., Saginaw, Mich., manufacturer of a complete line of carbon and graphite parts for electrical and other requirements. To overcome these difficulties, rigid heat treat cycles and program control were instituted to operate the battery of 10 Surface Combustion double-end oven furnaces. *(See Fig. 1.)*

To facilitate production, the material being treated is handled on transfer cars during all movements up to and away from the furnaces. Within the furnace, all charging and discharging is carried out simultaneously from both ends. This procedure speeds up handling and, by minimizing the number and extent of charge movements, reduces wear on furnace hearth plates.

The baking or heating stage in the manufacture of carbon brushes and similar carbon-graphite items is extremely critical. To insure uniformly satisfactory results, this operation calls for strict control over the rate of increase in temperature, its duration, and the rate of cooling during the latter portion of the cycle.

Continuous automatic maintenance of the critical rate of temperature increase required for these treatments warranted special consideration in the setting up of control procedures and equipment. A gradually changing heating rate and an accurate cooling speed had to be maintained over a time cycle of considerable duration.

To accomplish this delicate control and thus maintain the required balance of heating and cooling, continuous chart recording and indicating controllers (0° to 2100° F) with cam type program control are utilized. One set of instruments for each furnace is mounted on an individual panel and these panels are grouped at one central location in an adjoining room. (See *Fig. 3.*) Each panel contains either a strip or a sheet-type chart recorder and a heating rate interrupter operating from a cam type program controller. This cam, cut for the complete heating and cooling curve required, is constantly motor-driven. A cam follower, by synchronizing the controller interrupter with cam movement, gives off-on control of a butterfly valve in the air line manifold. This air line furnishes combustion air at 1-lb pressure from individual turbo compressors to the low-pressure burners on each furnace.

The one-valve, automatic proportioning feature of this gas-burning equipment readily adapts it to off-on type of control. Air under pressure acts as the

inspirating or entraining medium for gas at zero pressure, and automatically regulates the gas required for constantly correct fuel-air ratio. Shutting off the air interrupts the heat input for the required period of time. This action closely controls the heat input to rigidly maintain the desired temperature cycle and prevent overshooting, which would be detrimental to desired end-product qualities.

Heating rate continues

The heating rate required for these carbon parts must of necessity continue to increase as the soaking temperature is reached. This rate of increase is very critical and must be accurately maintained if the desired characteristics are to be attained.

Since products of combustion are not deleterious to the carbon-graphite parts being treated, the furnaces are direct-fired. Two banks of burners are located in each side wall, with one bank firing over the hearth at an angle to follow the contour of the furnace arch and the other bank firing under the hearth between strategically placed pier supports. Burners in opposing banks are positioned alternately for even heat distribution along the furnace length. (See *Fig. 2.*)

The firing positions of these burners impart a swirling motion to the heated products of combustion within the heating chamber. Even distribution of temperatures is maintained while detrimental direct-flame impingement charge is prevented. Adequate flues vent the products of combustion from hearth level and discharge them at the top of both furnace doors, where ducts convey them to several main outside vents.

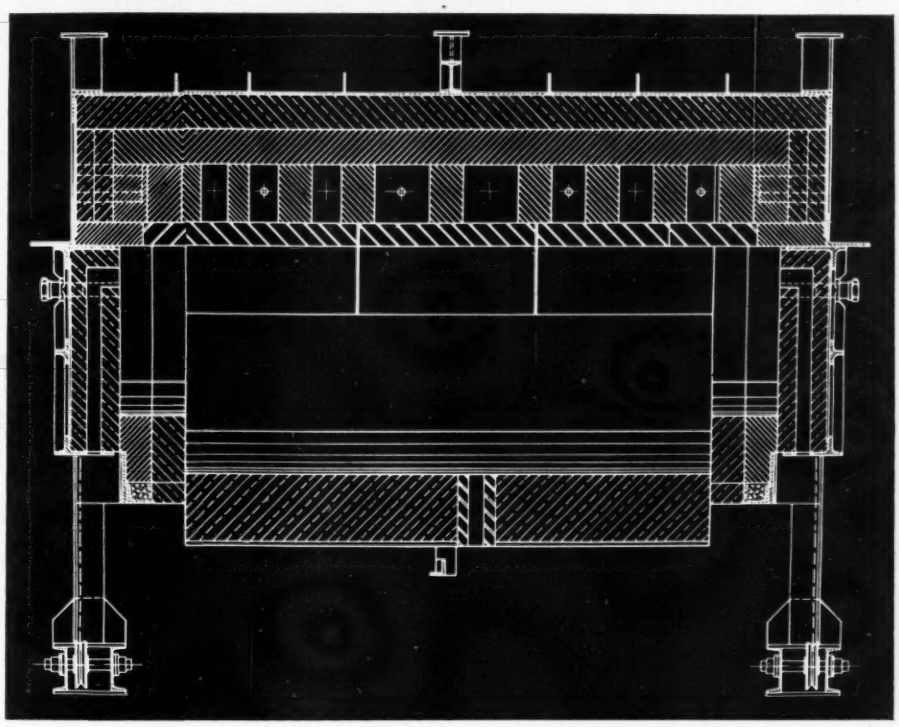


Fig. 2. Cross-section of double-end furnace showing location of doors and other construction features.

Fig. 3. Central control panel in adjacent room. Each panel unit program controls one furnace.

Portable fan

At a predetermined point in the cooling curve, the doors at both ends of the double-end furnace are opened and a portable fan moved into position in front of one of these openings. (See *Fig. 4.*) This fan is turned on and room air forced through the furnace. The final stages of the cooling cycle are thus greatly accelerated and the non-productive furnace idletime, encountered during furnace cooling, is reduced, permitting more rapid removal of the charge.

Program control of these furnaces has proven readily adaptable to the heat treatment of the carbon-graphite parts produced at the plant. The intricate time-temperature cycles required are accurately maintained to produce a product of highly uniform quality. The double-end feature of these oven furnaces speeds cooling to give maximum production, in spite of the inherent difficulties encountered with long cycle heat treatments.

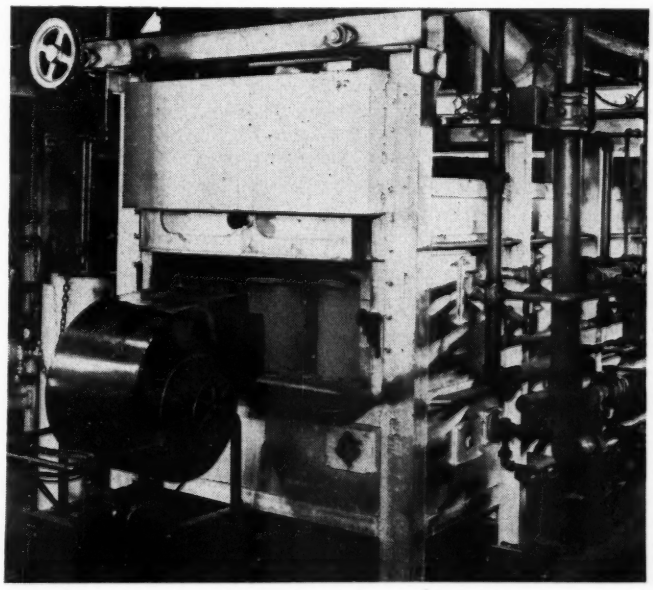
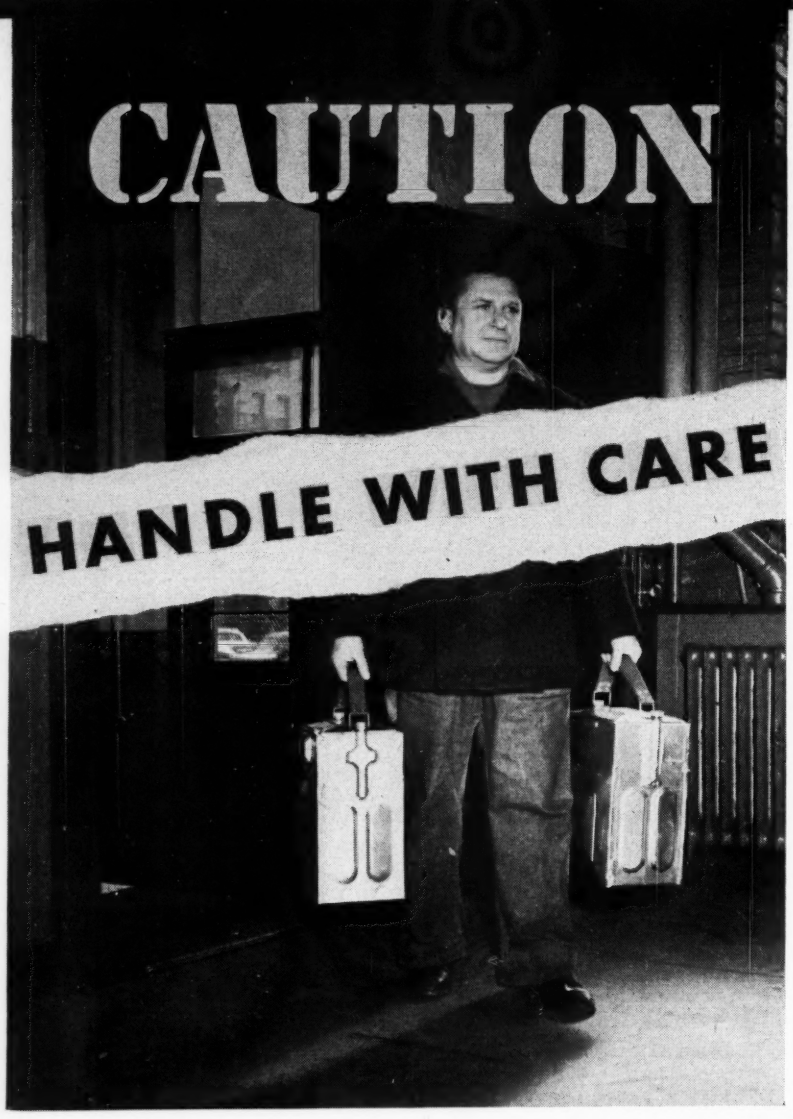
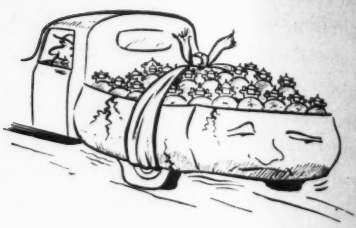


Fig. 4. Portable fan in position during accelerated cooling portion of cycle.



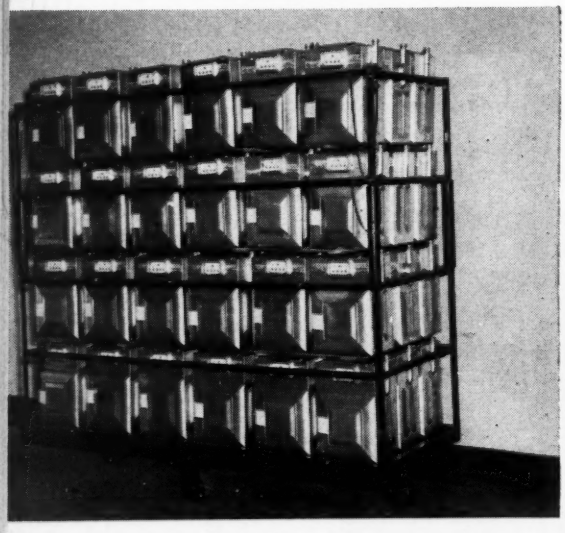
Carrying straps for individual use are ideal when two meters are being carried. By keeping the meters upright, the straps decrease the danger of a corner of the meter striking a step or other obstruction.



A GAS meter is, to be sure, a sturdy and well-built instrument, and under normal usage it has a long and useful life. But it will take just so much rough handling before something gives, and all the efforts of a meter shop in repair, overhaul, and proving can be undone in a moment's careless handling.

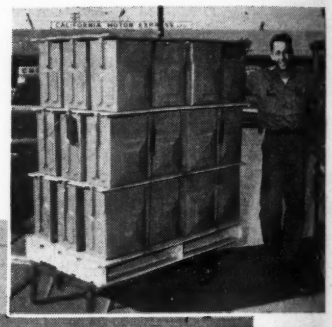
Not only will the appearance suffer, but its accuracy might be impaired as well. Leaks may easily develop. Foreign material might get in under the valve covers if the meter is turned upside down or tipped. The flag rod may bind as the result of a sharp blow.

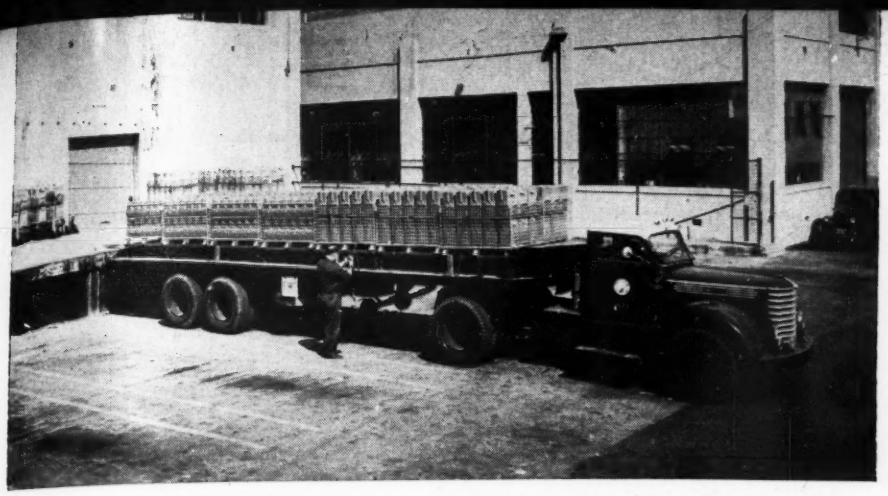
There are numerous methods that can be employed to move meters safely and with relatively little exposure to damage. Several that were shown before the AGA distribution meeting in Chicago recently by James Webb, superintendent of the meter bureau of Consolidated Edison Co. of New York Inc., are presented on these pages.



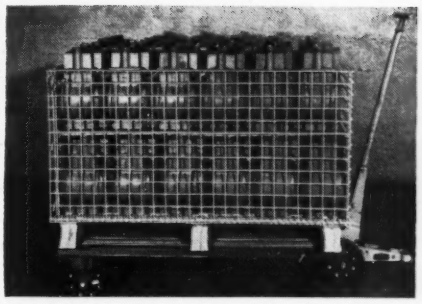
Among the best setups for moving meters in the shop as well as delivering them to district storerooms is the 72-meter truck.

For smaller numbers, pallets arranged in a manner such as these are handy.

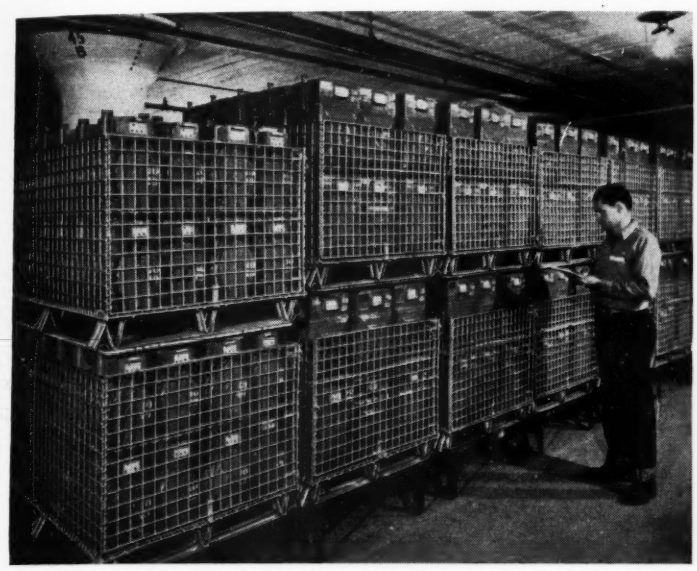




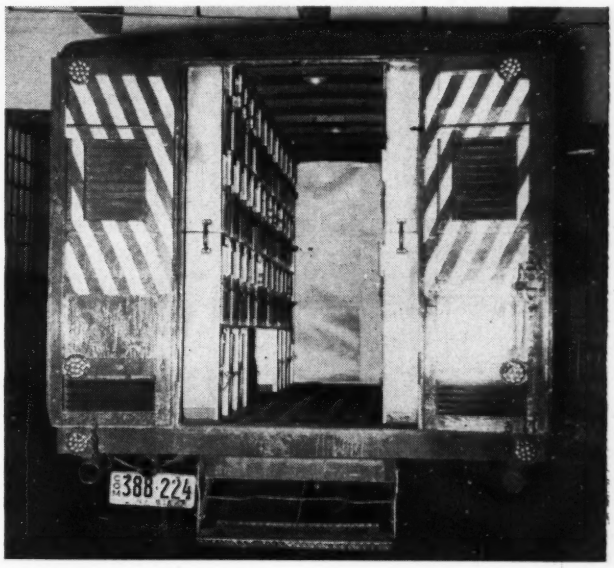
For over-the-road transporting to outlying district storerooms, a truck and trailer unit such as this can handle a number of combinations and arrangements of meters with little fear of damage.



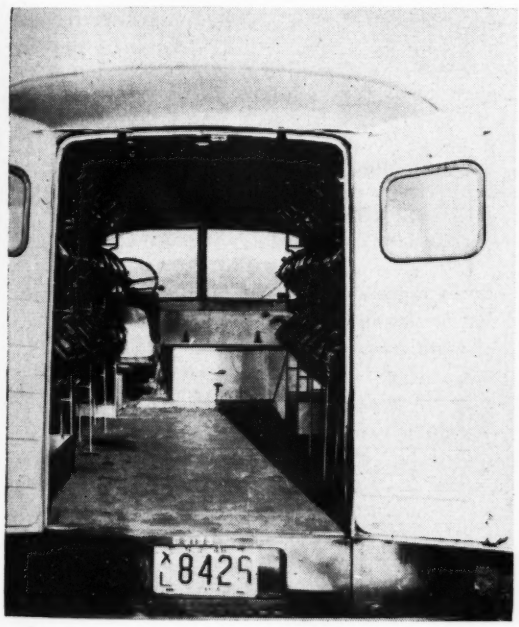
"Cargo-tainers," used with lift trucks, are useful meter-handling tools. They may be folded and stored in a small area when idle.



Cargo-tainers are also useful for storing meters that are awaiting installation. This method of handling meters effectively eliminates the possibility of meters slipping from storage piles.

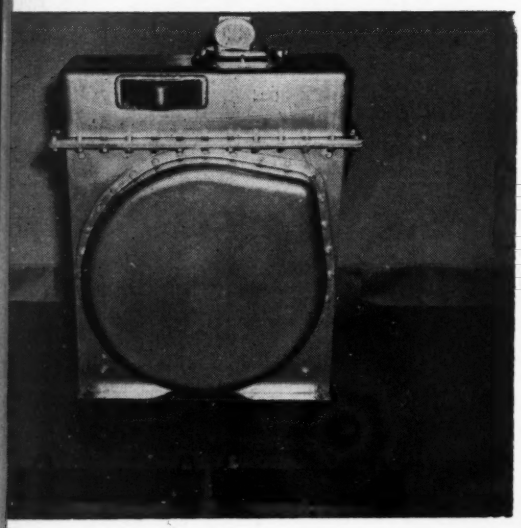


Good protection is needed in trucks supplying meters to field men for age change. One way: padded compartments, holding two meters each, built into truck.

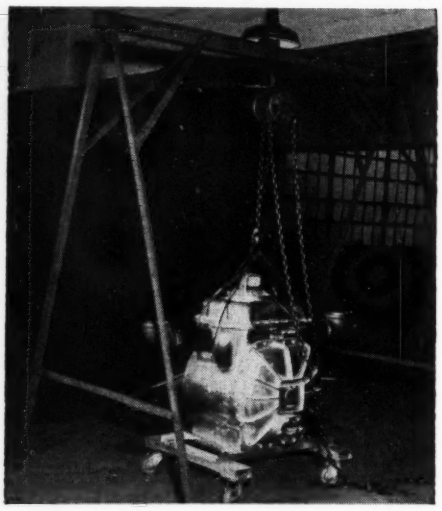


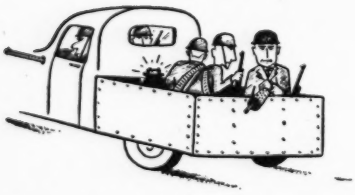
Another cradling device for protecting meters consists of an arrangement of pipe, covered with rubber hose as padding, which makes individual compartments for the meters.

Canvas straps are proven safety devices for protecting meters from jostling.

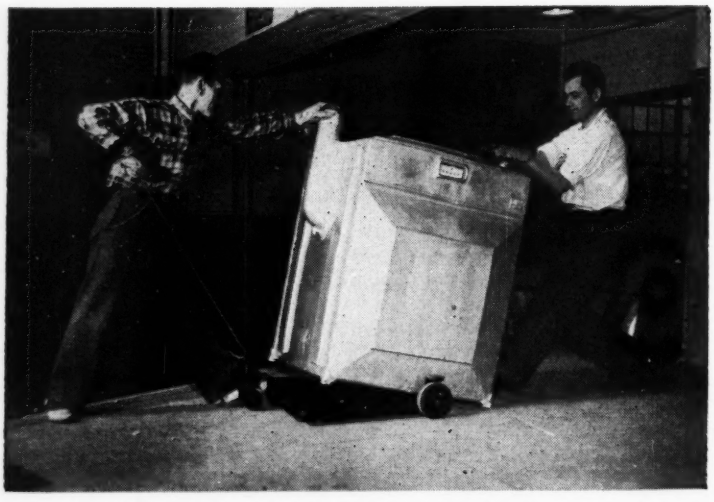


Clamp-on wheel sets may be used in place of dollies for moving large iron case meters. Meters remain clamped to the wheels or dollies until they are reinstalled, facilitating their movement through the shop.

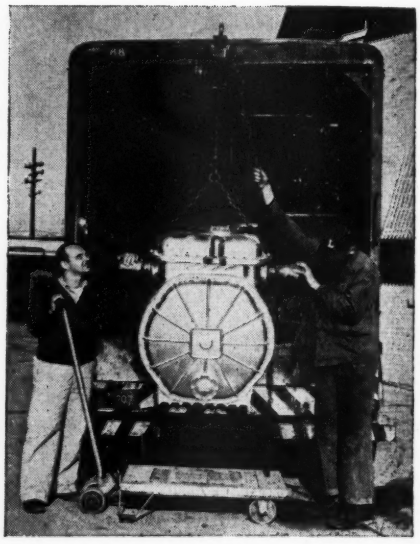




Although in the shop an overhead chain block is normally used for placing a meter on wheels or dolly, on a customer's premises a portable A-frame is convenient. This equipment is also useful for raising or lowering iron case meters through sidewalk openings in metropolitan areas.



This type of low platform truck is ideal for moving large tinned steel-case meters, although for smaller sizes regular hand trucks can be used.



Short nipples placed in the inlet and outlet openings of the meters accommodate slings for handling large meters. (Hooks or eyebolts cast into the case by the manufacturer would simplify and speed up this job.)

Tailgate lifts are recommended to eliminate the need for skids in moving meters on and off of trucks.

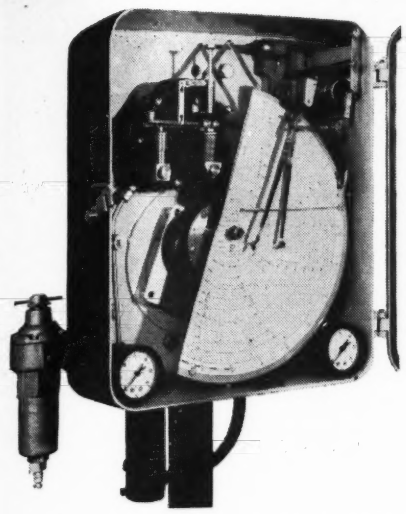


Fig. 1. Cutaway view of Rockwell orifice meter showing differential controller.

Differential controller

At Lawton, Okla., it measures and controls flow fluctuations ranging from zero to 390 Mcf per hour

By S. V. CARMICHAEL
Consolidated Gas Utilities Corp.
Lawton, Okla.

CONSOLIDATED Gas Utilities Corp. recently completed construction of 23 miles of 10-in. line from the Marlow field to Lawton, Okla., third largest city in the state. This virtually assures the city and the nearby Army field artillery school, Fort Sill, of a constant supply of natural gas.

Only an unforeseeable catastrophe can now interrupt the service to these two important centers. In the past they depended on a single 10-in. line from the Cement field, 30 miles to the north of Lawton. While proration problems make it advisable to continue to take most of the gas from the Cement field, the Marlow line must be ready to assume the entire load of both Lawton and Fort Sill instantly, should it become necessary. This requirement created quite a problem in measurement and control, since the delivery in a single hour may vary from zero to 1250 Mcf.

Heavy load on line

The rapid growth of both Lawton and Fort Sill since 1940, coupled with the erratic load of a larger power plant, which might vary from 65 Mcf per hour to a maximum of 650 MMcf per hour, had taxed the capacity of the Cement line during peak hours of extremely cold weather. Abnormally high pressure had to be maintained during these peak periods and this meant that dispatchers and field men had to be constantly on the alert. The installation of radio communication undoubtedly made their work much easier. With completion of the Marlow line it was possible to lower the pressure on the Cement line to a normal figure.

Measurement problem

When it became evident that the measurement of the gas delivered through the Marlow line would present a problem because of the big difference between the minimum and maximum flows, the company installed a differential controller, the first it had ever used *(Fig. 1)*.

Orifice meter runs

Two 8-in. orifice meter runs were built at the Lawton terminus of the Marlow line. The outlet was connected to the Cement line just ahead of the Lawton border station, in which gas is measured for both the distribution system and the Public Service Co. power plant. Two pilot-loaded regulators were installed on the upstream end of the meter runs with the controls set to start a flow of gas through the station when the pressure on the Cement line dropped to a predetermined point. Eight-in. gear-operated Nordstrom valves were used on both the inlet and outlet risers of the meter runs, with the exception of the inlet valve of the secondary run, which is a standard cylinder-operated Nordstrom valve. This valve may be seen in *Fig. 3*, together with the small

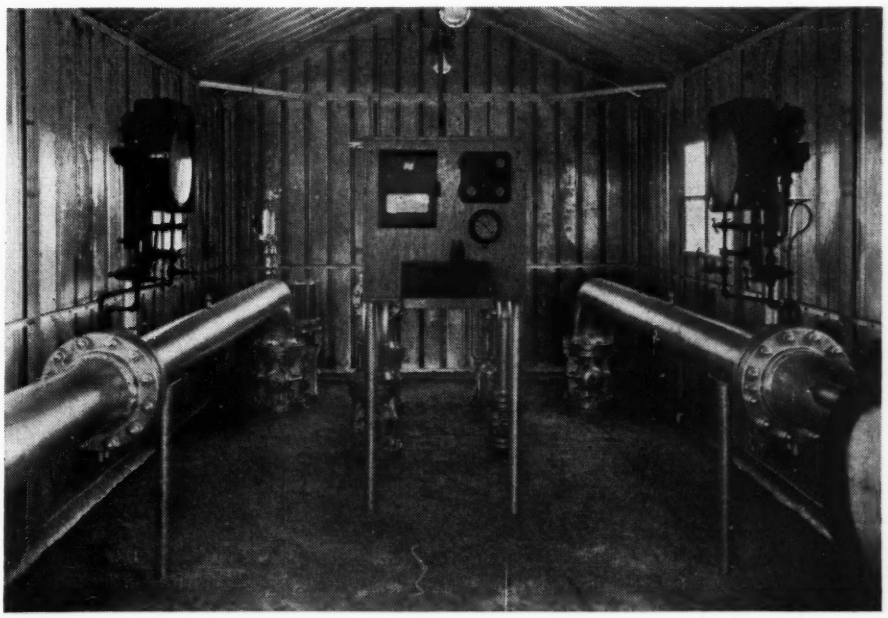


Fig. 2. Interior of meter house showing two meter runs equipped with Nordstrom valves and orifice meters and differential controller.

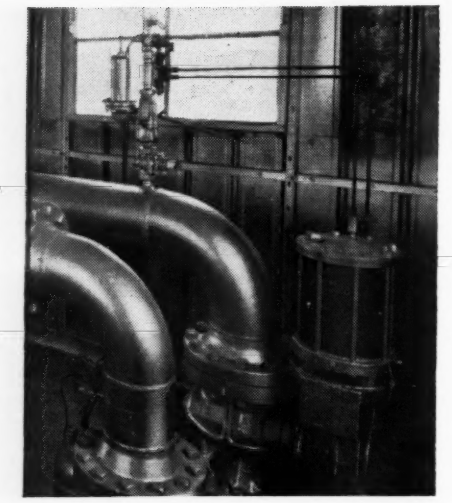


Fig. 3. Close-up of cylinder-operated valve operated by differential controller.

valve which actuates it on the end of the meter run.

Since it was desirable that a very accurate measurement be made of the gas passing through the station, two standard orifice meters were installed on the runs. The primary meter (the one on the right in *Fig. 2*), contains the differential controller built in the meter case so that no additional space is required on the meter run. Although the control unit is mounted in and connected to the meter itself, it is so constructed that no sacrifice is made in the accuracy of the meter.

When the flow through the primary meter reaches the maximum limit at which the controller is set, a four-way diaphragm-operated valve is set in motion, and this in turn opens the cylinder-operated valve on the inlet riser of the secondary run. When the flow through the primary meter drops back to the minimum setting of the controller, the reverse takes place and the secondary run is shut off. Because of the positive action of the valve, no gas can possibly leak through when the secondary run is shut off, something not assured with the use of conventional meter loop valves or converted soft seat regulators. Another distinct advantage of this valve is the shortness of the run, since no additional length is necessary for the installation of another valve in the run itself.

Since this is the first installation of the differential controller, its operation has been watched closely, and exhaustive tests have been made to ascertain if the accuracy of the meter was in any way affected by the addition of the controller to the meter. All tests have proven highly satisfactory. Since its installation in the Lawton station it has measured and controlled flows from zero to 390 Mcf per hour, with the peak winter load yet to come. Even with a much larger load sure to be placed on the station no trouble with the differential controller is anticipated, since its range is limited only by the size of the meter runs on which it is located.

Residents buy snow-melting machine to keep street free for traffic

When winter's sleet and snow come to Coshocton, Ohio, the street most likely to be usable and free from dangerous skidding hazards is Hillcrest drive, one of the steepest roads in the community with a 15% grade.

This freedom is not due to a freak of nature that provides unusual shelter but to the enterprising residents and property owners of land on top of Hillcrest who chipped in to pay for and operate a snow-melting system that now serves the 700-ft street.

Wrought iron pipe coils are laid directly on top of the old bituminous pavement and covered with 2 in. of black top surfacing. Heated water mixed with anti-freeze is circulated through the pipe network to prevent ice from forming and to melt snow as it falls. Coils are spaced to provide ample traction area for wheels of cars using the street. In practice, of course, the melting system helps hasten complete snow clearance across the entire width of pavement.

The cost of operating the system amounted to $116.40 the first season, which was prorated among the property owners. Installation costs to each owner in the cooperative enterprise totaled $513, including the expense of new paving and additional improvements which will step up the rate of melting from 1 in. to 3 in. per hour. The total cost of the snow melting system itself, including improvements in operating equipment, amounts to $4680, less than $335 per owner.

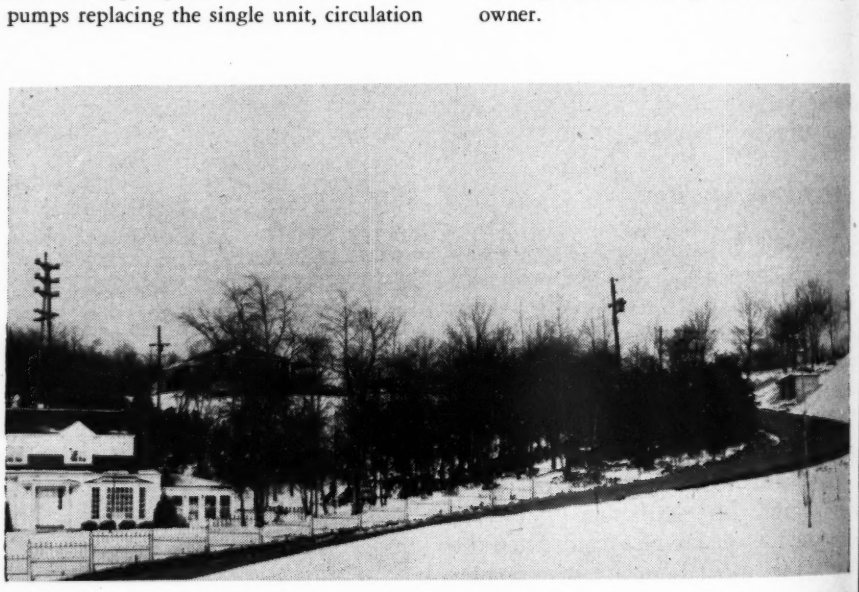
Approximately 4200 ft of 1¼-in. wrought iron pipe welded to 2½-in. headers is used to form the "tracks" coils. Each coil is comprised of three runs of pipe. Wrought iron pipe was selected because of its ability to resist corrosion and absorb vibrations caused by traffic, and because it is easy to install.

To operate the system during its first winter, two 250,000 Btu capacity boilers were used with one pump. With the addition of two more Hook & Akerman boilers of 200,000 Btu capacity and two Bell & Gossett pumps replacing the single unit, circulation is expected to be improved and the melting ratio of the system advanced.

Last winter, the system was operated manually, but an automatic unit is being installed to start the machinery as soon as the first snow falls. An "electric eye" is beamed on a black plate to set the system operating as soon as the plate becomes covered with snow.

All of the operating equipment, including pumps and boilers, is housed in a cement block house which was especially constructed for the purpose. It is located midway on the slope within a short distance from the road.

With the boilers now served by natural gas rather than the liquid fuel used during the first season of operation, the fuel bills are expected to average less than $10 per owner.



Snow-free Hillcrest drive is kept in this condition by wrought iron coils through which heated water mixed with anti-freeze is circulated.

$40 million plant for producing chemicals from natural gas opened

At Tuscola, Ill., 400 MMcf of natural gas will be processed daily to extract valuable hydrocarbons and chemicals.

NEAR Tuscola, Ill., a small town in a farming area where two huge natural gas lines cross, has risen one of America's largest plants for the extraction of hydrocarbons and chemicals from natural gas.

Built by the National Petro-Chemicals Corp., this $40 million project was slated to start operations last month. Its 450-acre site, consisting of former corn and soybean fields, gives it a great potential for the eventual addition of other units.

The National Distillers Corp. and Panhandle Eastern Pipe Line Co. are cooperating in the project on a 60-40 basis. Fifteen hundred workers were employed in the erection of the plant, and for around-the-clock operation it is expected to require about 400 employees. Thus the investment will be about $100,000 per worker.

400 MMcf per day

Every 24 hours about 400 MMcf of natural gas will be processed. This processed gas, retaining 98% of its fuel value, will be returned to the gas transmission lines, and from Tuscola over 700 MMcf will be sent eastward every 24 hours. The processed part of this will be drier and free of condensable gases.

With the exception of supervisors and laboratory technicians, the entire chemical operation will be done by specially trained employees from the area and from such nearby communities as Decatur, Champaign-Urbana, and Mattoon. Payrolls will amount to several millions yearly.

The plant is a new venture for National Distillers Products Corp. National Petro-Chemicals Corp. will direct activities at the Tuscola plant.

Panhandle Eastern built its first pipeline across the rich Tuscola farm lands in 1931. Now three parallel lines follow most of its route. In addition, about a year ago Panhandle's subsidiary, Trunkline Gas, as a part of a $100 million expansion program, started delivery of gas from the Gulf coast to Panhandle's main lines at Tuscola.

Water wells

To obtain water for the plant, National Petro-Chemicals has drilled its own wells near Champaign, Ill. The water from them flows toward the Kaskaskia river, augmenting its natural flow. Thus, water is brought 25 miles downstream for the new plant.

Gas goes from the compressor station and is received by the extraction plant, where the hydrocarbon concentrate is recovered at sub-zero temperature and is then piped to the fractionation plant. There it is broken down through distillation into ethane, propane, butane, isobutane, and natural gasoline. All of these products, except ethane, are recovered as liquids under pressure and are stored for shipment.

Next, the ethane gas goes to the ethylene plant where the ethane is cracked and transformed into ethylene. At the alcohol plant the ethylene is combined with water to make ethyl alcohol and ethyl ether. At the ethyl chloride plant ethylene is combined with hydrogen chloride to make ethyl chloride.

Facilities are being provided for product storage, shipping, power, and water storage. The Baltimore & Ohio Railroad has laid more than a mile of track to the site. The project is expected to produce 195 million gals. of chemicals and L. P. gas a year, and this would require the capacity of 19,500 tank cars.

Estimated loading rates out of the storage areas: ethyl alcohol, 3000 gals. per minute; ethyl chloride, 200 gals. per minute; L. P. gas, 900 gals. per minute. Loading facilities include a 40-tank-car loading rack for railroad shipments, adjoining a five-position truck loading rack.

Steam production from the power unit will be 600,000 lbs per hour, at 625 psi and 750° F. Processed natural gas will be burned under the boilers. In winter, coal will be an alternate fuel. This is to provide for the use of gas in domestic areas if needed there.

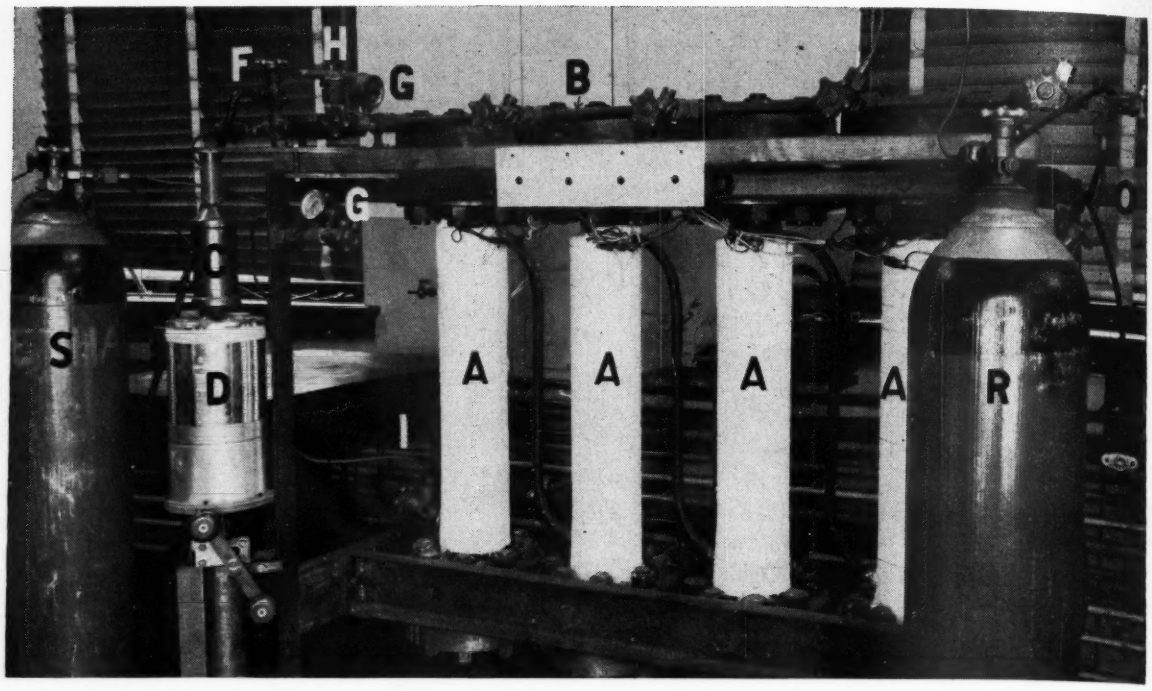
Estimated water needs

The plant has an estimated need for water of 3000 gals. a minute, or 4.3 million a day. Power production will take 12,000 kw at 12,500 volts for chemical processing, fire control, waste disposal, etc. Water cooling towers are located in the center of the project to conserve water. A "lake," 17 acres in capacity, has been dug out of flat land near the Kaskaskia river, to store 100 million gals., a two-week supply. Water in it is pumped from the river. And from the plant, after being used, the water will be returned to the river, free of waste. Officials work with the state to avoid any pollution by waste.

A sulfuric acid unit, operated directly by National Distillers Products Corp., was also constructed. This product will be sold to National Petro-Chemicals for use in making ethyl alcohol, and to other buyers.

Most other petrochemical plants were based upon recovery of by-products gases from refineries, and so have been built at less cost. Thus this plant is regarded as substantially larger, in its initial stages, than any other. As an indication of the plant's scope, its investment per employee is roughly 10 times that of the normal chemical plant.

Annual volume of products is estimated as: LPG, 140 million gals.; natural gasoline, 6 million gals.; ethyl alcohol, 40 million gals.; ether, 3.5 million gals.; ethyl chloride, 6.5 million gals.



Apparatus for purifying methane to obtain a primary standard gas

The apparatus for absorbing heavy hydrocarbons consists of the following parts: Four purifying towers (A) each with a capacity of 214 cu in. connected in series. The first tower on the left is filled with silica gel and the other three with activated cocoanut charcoal (6-8 mesh). Each tower is wrapped with a heating coil of sufficient capacity to heat the tower and its contents to a temperature of 150°C for the purpose of reactivation; a manifold (B) with valves for connecting cylinders to either the inlet (I) or the outlet (O) of the purifiers; a condenser (C) for condensing the gas by means of liquid nitrogen contained in the Dewar flask (D). This flask can be raised or lowered around the condenser by means of an adjustable platform; a vacuum pump connected to the manifold at (F) for evacuating the entire system; and pressure gauges (G) for observing the pressure in the system. A valve (H) enables the manifold to be divided into two parts so that the supply cylinder (S), the condenser (C), and the inlet to the purifiers can be separated from the outlet from the purifiers and the receiving cylinders (R).

How to obtain a high-Btu standard gas for studying a calorimeter's accuracy

By **JOHN H. EISEMAN** • National Bureau of Standards, Washington

THE Thomas recording gas calorimeter is normally calibrated with pure hydrogen, which is rated at 319.4 Btu. With the increased use of higher heating value gases, a wide span of extrapolation is required in the calibration —which raises the question: Are the results with hydrogen being extrapolated too far?

The tremendous increase in the use of natural gases during the past few years and the change from a cubic foot to the therm or heating value basis for the marketing of much of this fuel has resulted in a growing concern on the part of many gas utilities regarding the accuracy of the methods used for determining heating value.

Two methods

There are at present two general methods for determining the Btu per cubic foot of fuel gases. The first and oldest is by means of the manually operated water-flow calorimeter. This method is what might be called a spot test and will give satisfactory accuracy if the ASTM method of procedure is carefully followed. However, natural gas does not maintain a constant heating value and may vary over a wide range from day to day or even from hour to hour. Some changes are rapid and of considerable magnitude. A trained operator can make a manual determination in approximately 30 minutes. If a test were made every hour around the clock it would only produce 24 tests and the average would not always present a true picture. Obviously, the answer to a varying heating value is a continuous automatic record.

At the present writing, the only instrument of this kind on the market, in this country, is the Thomas recording gas calorimeter.* This instrument has been carefully engineered and has received wide acceptance in the gas industry but most of the need for accurate recording in the past has been in the low Btu or manufactured gas areas. A number of studies of the accuracy of this instrument on gases ranging from 500 to 700 Btu per cubic foot have been made and the results of these studies have indicated that an accuracy well within 1% can be obtained, provided the calorimeter is given the necessary care and provided also that the heating value of the gas being tested does not vary too rapidly.

Today much the greater part of the gas used in the United States is natural with heating values well above those used in the previous studies.

With costs based on the Btu per cubic foot in much of the present natural gas area, the accuracy of this instrument at these higher heating values is of great importance.

Pure hydrogen used

The Thomas calorimeter is normally calibrated with pure hydrogen (319.4 Btu). The operation requires a change in gears which varies the ratio and speed of the drums so that the reading will fall in the range of the instrument. With the increased use of the higher heating value gases some doubt has been expressed as to whether an equal accuracy could be assumed in these higher ranges. In other words, are the results with hydrogen being extrapolated too far?

As a result of this uncertainty, the chemical committee of the American Gas Assn. requested the National Bureau of Standards to undertake a study of the accuracy of the recording calorimeter when supplied with high Btu gases.

Studies on this subject are now in progress and it is hoped that they will be completed and a report published before the close of this year.

One of the first problems which presented itself at the beginning of this work was that of obtaining a standard gas for test purposes, the heating value of which was in the range of the usual natural gases and the value of which could be determined by some method to at least one order of magnitude greater than could be expected from the recording instrument under test.

*Manufactured by Cutler-Hammer Inc.

The ideal gas for this purpose is a pure methane. Methane is the chief constituent of natural gas and has a heating value of 997.4 Btu per cubic foot.

Less impurities

A supply of methane was obtained that contained much less impurity than the usual run of natural gas. It was our hope that an analysis of this gas by means of the mass spectrometer would enable us to calculate the heating value with the desired accuracy.

Unfortunately, it was found that it would be necessary to further purify this gas even though all of the impurities totaled less than one-half of 1% because the several constituents which were present produced overlapping spectra which introduced too much uncertainty for an accurate calculation. The analysis of this gas as received was as follows:

Methane (CH_4)	= 99.67%
Ethane (C_2H_6)	= 0.15%
Nitrogen (N_2)	= 0.04%
Propane (C_3H_8)	= 0.07%
Propylene (C_3H_6)	= 0.02%
Butane (C_4H_{10})	= 0.02%
Carbon dioxide (CO_2)	= 0.03%

In order to calculate the heating value of this gas with the desired accuracy, all of the ethane and carbon dioxide would have to be removed and it would be desirable to also remove the propane, propylene, and butane. In short, it was hoped to remove everything except the nitrogen which would not intefere with an accurate analysis.

It is well known that activated cocoanut charcoal will absorb ethane and other hydrocarbons at room temperature. It is also known that better adsorption is obtained as the pressure is increased.

The apparatus which was built to utilize the adsorbing power of activated cocoanut charcoal is shown in the photo.

The whole apparatus was built so that it would withstand a hydrostatic pressure of 2500 psi.

Dried instrument

Following the hydrostatic test, it was necessary to dry out the entire apparatus thoroughly. A preliminary drying was accomplished by passing room air through for two days at a rate of approximately 180 cu ft per hour by means of the vacuum pump. Air was then drawn through for four more days but before it entered the apparatus the room air was dried by means of a large drying tower of silica gel. This gel was changed each day and the used desiccant reactivated in an oven heated to 245° C.

During the fourth day of purging with dry air a drying tower was also placed on the outlet of the apparatus and the amount of water picked up in each drying tower was determined. When the tower on the outlet picked up less water than the one on the inlet, it indicated that the air within the apparatus was drier than the room air. When this condition was reached the purging with air was discontinued and the apparatus was evacuated by means of the vacuum pump until a pressure of only a few millimeters of mercury was shown on a sensitive vacuum gauge connected at one of the manifold valves. Dry air was then admitted slowly, with the vacuum pump still running, so that the vacuum gauge remained within a few millimeters of its former reading. This air could pick up and carry out any water vapor liberated from small cracks or crevices in the interior.

Low pressure

After several hours of this treatment the air inlet was closed and the pump allowed to run until the pressure in the entire apparatus was as low as it would go. Valve (F) was then closed, the vacuum pump turned off and the vacuum gauge read. If there was a decrease in the vacuum within the apparatus, it might indicate a leak in the system or more water vapor being liberated or both. After about a week of this procedure, it was found that the apparatus could stand evacuated overnight without any change in pressure and it was therefore both dry and vacuum tight and ready for use.

With the apparatus still evacuated, a supply cylinder (S) was connected to the manifold and the gas from this cylinder was allowed to flow into the purifiers, through valve (I), at a slow rate until a pressure equilibrium was reached. The inlet valve (I) was then closed and the supply cylinder (S) was connected to the condenser (C) and gas was condensed from (S) into (C) by cooling it slowly with liquid nitrogen. This was accomplished by gradually raising the Dewar flask (D) containing the liquid nitrogen around the condenser and watching the drop in pressure in (S).

Gas was condensed until the pressure in the supply cylinder had been reduced by 150 psi, which was the amount of change which had been calculated to fill

Glass blocks for easy meter reading

The Public Service Gas & Electric Co., Newark, N. J., has hit on a new way to save time and money and to offer added convenience to home owners by mounting gas meters directly behind a glass block installed in an outside wall of the home. The transparent PC VUE block, manufactured by the Pittsburgh Corning Corp., lets the meter reader take his readings without entering the house.

More readings

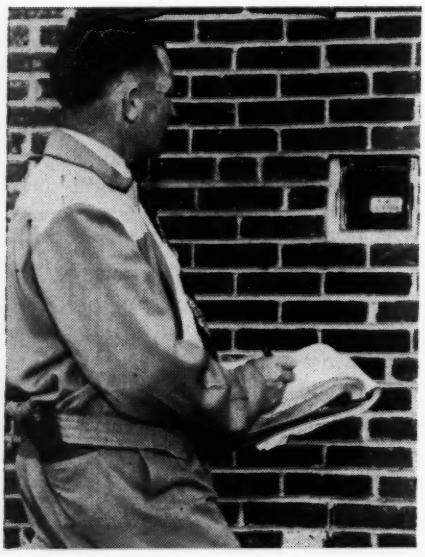
Public Service estimates that by taking meter readings through the glass block, meter readers can take many more readings a day than ever before, and believe that this is a practical and economical answer to several problems: boosting customer service relations, speeding meter reading production, reducing customer correspondence and estimated bill complaints, and eliminating back-calls.

VUE blocks can be installed in all types of homes—frame, brick, concrete block, and poured concrete. Public Service reports that builders profit, too, when they install the blocks in their homes, because the VUE block adds another building feature to be pointed out to prospective customers.

Eliminates nuisances

Home owners also benefit: meter readings can be taken at any time, no more need bills be estimated, bad weather-dirty floor visits and special "stay-at-home" days to let the meter reader in are eliminated.

The VUE glass block is 8 in. square and 4 in. thick with smooth water clear faces for good vision. The hollow blocks have an insulating value equal to an 8-in. masonry wall.



Public Service meter reader checks meter in transparent block installed in brick wall.

the condenser (C) about two-thirds full of liquid. At this point cylinder (S) was turned off and the liquid nitrogen lowered from the condenser. When the pressure in the condenser rose to that of the gas already stored in the purifiers, the valve between the condenser and purifiers was opened and the gas from the condenser was allowed to flow into the purifiers until the condenser was back up to room temperature and an equilibrium pressure was obtained.

This process of condensing gas from the supply cylinder and transferring it to the purifiers was continued until the pressure of gas in the purifiers had been built up to approximately 1400 psi, which usually required about three condensations. The inlet valve (I) was then closed and the gas allowed to remain in contact with the purifying material for approximately 12 hours or overnight.

Gas sampled

A small sample of gas was then drawn from the outlet of the purifiers and analyzed by means of the mass spectrometer. If the results indicated no impurities except nitrogen, then the gas was allowed to flow from the purifiers into the evacuated receiving cylinder (R) until the pressure between the two came to equilibrium. The above cycle was then repeated with each purification adding about 50 lb more gas to the receiving cylinder (R) until the pressure in this container had been built up to at least 1000 psi. It was then removed from the system, the gas mixed by setting up convection currents within the cylinder and then sampled and analyzed again. If this analysis showed no ethane or impurities other than inerts, the heating value of the gas was calculated from this analysis and the gas was ready for use as a standard.

Whenever a sample from the outlet (O) of the purifiers showed a trace of ethane, the process was stopped. The gas in the purifiers was condensed and returned to the supply cylinder. The heaters surrounding the purifying towers were turned on and the system evacuated by means of the vacuum pump. Each heating element was thermostated so that a temperature of 150° C was maintained on each of the four towers. It was found that an overnight run was sufficient to reactivate the cocoanut charcoal. It was possible with the system used to purify three or four batches of gas before reactivation was required.

Four 220-cu ft cylinders of purified gas were obtained by this process, each cylinder being filled to a pressure of approximately 1000 psi.

TABLE 1

Cylinder No.	Analysis by Mass Spectrometer	Calculated Heating Value Btu per cu ft	Probable Errors Btu
127	CH_4 = 99.93 C_2H_6 = 0.01 N_2 = 0.06	996.87	± 0.2
130	CH_4 = 99.92 C_2H_6 = 0.00 N_2 = 0.08	996.64	± 0.1
133	CH_4 = 99.93 C_2H_6 = 0.00 N_2 = 0.07	996.74	± 0.1
134	CH_4 = 99.93 C_2H_6 = 0.01 N_2 = 0.06	996.87	± 0.2

The results of the analyses of each cylinder after purification are shown in *Table 1,* together with the heating value calculated from these results. The table also indicates that the error in these calculations is not more than plus or minus two-tenths of one Btu, which is a sufficient accuracy for the purpose.

Mass spectrometer

The method described is adequate to purify a sample of methane, as obtained from California, so that an analysis by means of a mass spectrometer can be used for calculating the heating value. The heating value thus obtained is much more accurate than the results from the recording calorimeter could be expected to be and the gas is therefore suitable for use as a standard in testing the accuracy of this instrument.

Having obtained a primary standard gas in this manner, it is possible to compare the original gas from California with this standard gas and use the unpurified gas as a secondary standard.

If sufficient gas of this purity is available or if it is possible to purify the usual run of natural gas so that it will be equal to the purity of the special gas from California, then it should be possible for someone to provide the industry with a certified gas, which could be used for calibrating purposes.

Guy Corfield, of Southern California Gas Co., was instrumental in obtaining the methane for the tests. Acknowledgment is also made of Mr. Corfield's suggestions regarding the procedure by which the further purification was obtained.

This article is adapted from a talk presented at the May 25-27 production and chemical conference in New York.

Handyman

Maintenance of iron sponge requires the periodic addition of formaldehyde (which prevents molding), lime, and soda ash to restore its effectiveness. These ingredients must be mixed thoroughly into the sponge; at Metropolitan, this is done with a cement mixer, which empties the mixture onto a conveyor belt for transporting into piles 8 ft high.

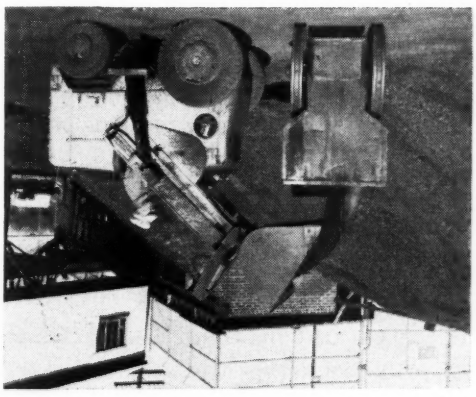
. . . A versatile tool for the gas plant is the tractor shovel, which has a multitude of uses.

MATERIALS handling equipment of varying descriptions is particularly handy around the gas plant, where coal, iron sponge, barrels, tools, and an assortment of odds and ends must frequently be transported.

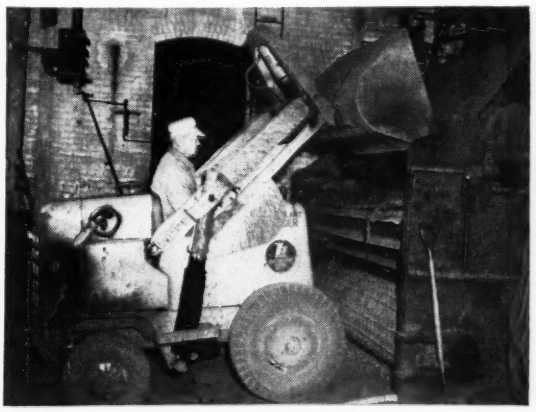
At Metropolitan Utilities District, Omaha, it's been found that a single piece of rolling equipment can do several jobs, relieving manpower and effecting sizable savings. The device is the tractor shovel.

Metropolitan uses water gas standby to supplement its base load of natural gas, and many bulk materials must be handled about the plant—coal, coke, ashes, etc. Every 24 months 60,000 bushels of iron sponge must be revivified, in order to remove the impurities which it absorbs from the gas, and this process involves considerable handling. In this work, the tractor shovel has many uses. Some of these applications, as well as others, are shown on this page.

Among the numerous uses not depicted, however, are those jobs which must be done by the construction department in the placement of mains, in system maintenance, and in building projects. Here tractor shovels operate as bulldozers, loaders, tractors, mobile cranes, and even fork lifts, and effectively replace other and more costly types of machinery.



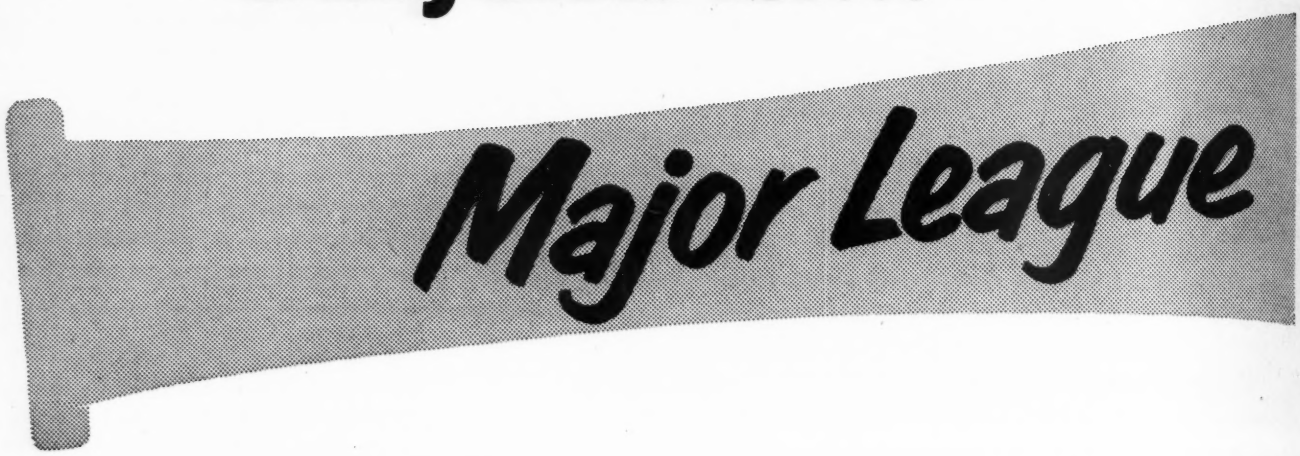
The mixers are fed by the tractor shovel, which handles 200 12-cu-ft loads per 8-hour day and enables a single operator to replace a five-man gang. The stockpile shown in the background (left) must soon be broken down and redistributed around the drying yard to a height of approximately 3 ft to permit "airing out" and prevent the rapid molding which would otherwise occur. One machine can redistribute a stockpile in a few hours. The tractor shovel is handy for loading coke buggies too (right).



In an average winter, 3500 tons of coal must be brought in from the outdoor stockpiles to be fed directly into the boiler hoppers.

Full oil drums weighing 400 lbs can be loaded onto trucks with tractor shovel.

Now Duo-Therm strikes a big blow for...



At last...Big League support on Incinerators! Here it is —from Duo-Therm . . . a complete, timely promotion package designed to help you move your incinerator selling program up from the "minors" to the big time. It's big! It's new! It's hard-hitting—and it's yours now behind the hottest new appliance in the industry—the new Duo-Therm Gas Incinerator.

You'll hit prospects where they live . . . this summer and fall. In their own back yard! At a time when garbage and trash cans are at their worst, when yard after yard is ripe for an incinerator sale. Duo-Therm sales messages and merchandising ideas will pull those prospects to your store!

Duo-Therm national ads score, too! The Duo-Therm Gas Incinerator will have a feature spot in every Duo-Therm national ad this year. This is real help in selling the new ease and convenience of Duo-Therm's automatic garbage and trash incineration. And don't forget...all the consumer acceptance national advertising has built for the Duo-Therm name is now behind this big, new Duo-Therm product!

Yours, exclusively from Duo-Therm now! Duo-Therm now provides you with a major-league product backed by major-league promotion. It's yours only from Duo-Therm—this complete Incinerator Promotion Package. Simply fill in coupon and mail direct to factory and we'll have your distributor contact you.

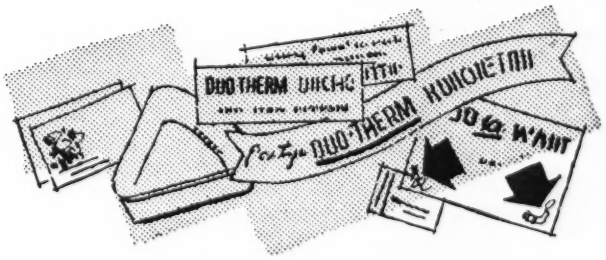
Oil and Gas Home Heaters • Oil and Gas Automatic Water Heaters • Automatic Oil Furnaces • Automatic Gas Floor Furnaces

DUO-THERM is a registered trade mark of the Motor Wheel Corp. Copyright, 1953

Incinerator Selling!

Team up with Duo-Therm . . . and bat 1.000!

The complete Duo-Therm Gas Incinerator Promotion Package has everything you need for an intensified "local area" sales campaign. You get newspaper and direct-mail advertising materials, in-store display suggestion, wall and window banners. And Duo-Therm furnishes other new and sure-fire promotion ideas and give-away items that will make Duo-Therm Gas Incinerator sales boom in your community!



NEW DUO-THERM GAS INCINERATOR
is the fully automatic way to burn ALL garbage and burnable trash. LOAD IT... DIAL IT... FORGET IT! Positive, sure, complete burning. 5 models.

new type!
Direct Fire

Approved by the American Gas Association

More than 2 million warmly satisfied customers...

DUO-THERM
Always the Leader
Division of MOTOR WHEEL CORPORATION
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Duo-Therm Div. of Motor Wheel Corp.
Dept. G- Lansing 3, Mich.

Rush me your Sales Promotion Sample Package on the new Duo-Therm Gas Incinerator.

Name_____

Address_____

City_____ Zone____ State_____

Thermally Thinking

Continued from page 22

ance for purchases of construction materials. However, these totals do provide a rough measure of expansion during the mobilization drive—and give a good idea of how many papers were shuffled by PAD.

New England settlement near

The long standing controversy over the New England gas market likely has been ended by settlement between the rival pipeline interests, and FPC approval is more or less taken for granted here. Settlement of the controversy departs somewhat from the usual regulatory practice of determining service areas, but the proposed compromise plan does not vary greatly from that approved by the FPC two years ago.

The FPC certificate splitting the New England market was sent back to FPC by the 3rd U. S. Circuit Court of Appeals on procedural grounds, which involved further protracted hearings. Northeastern Gas Transmission Co., in taking to court the FPC's order granting Algonquin Gas Transmission Co. a service area certificate, had objected to the division of the New England market on grounds of wasteful duplication of facilities. Now, economic pressure —the fight was costing the companies plenty of money every month—has dictated the settlement.

Under the compromise proposal, Algonquin would serve southern New England markets in Rhode Island, Connecticut, and New Jersey, and parts of Massachusetts. Blackstone Valley Gas & Electric Co., originally assigned to Algonquin, would be served by Northeastern, which also would serve New Hampshire, Maine, and parts of Massachusetts. In addition, Tennessee Gas Transmission Co., which owns Northeastern, would be allowed to supply certain intervenors along the southern portion of its line and would be given rights to export natural gas into Canada, as it had requested.

All parties—except the coal interests and some labor interests allied thereto—were in agreement on the compromise, subject only to approval by FPC.

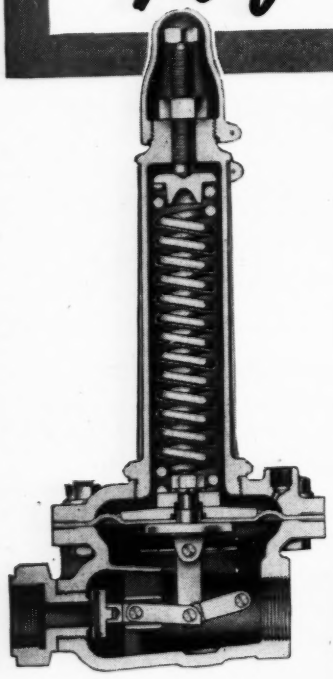
FPC is shorthanded again

Speculation about a successor to Commissioner Harrington Wimberly, the former chairman of the Oklahoma Democratic Party until he was named to the Federal Power Commission by President Harry Truman six years ago, is quite restrained. Nobody seemed to know whom the President might appoint, and there were a few who predicted that Mr. Wimberly might fit the President's specifications, except that Mr. Wimberly is a Democrat who didn't vote for Mr. Eisenhower. The Wimberly term expired in late June.

More liberal policy seen

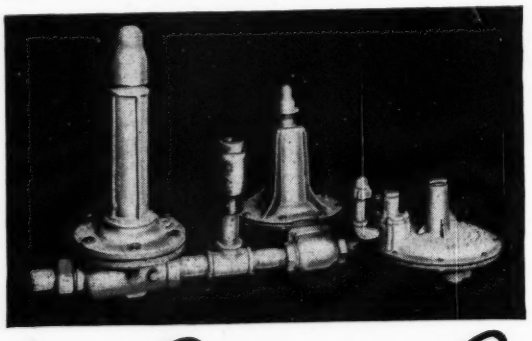
Hopes throughout the gas industry that the FPC will adopt a more liberal attitude on the amount of return needed to attract capital have been zooming because of reports that FPC Chairman Jerome Kuykendall has approved a re-

IN THE HIGH PRESSURE FIELD
THERE IS SAFETY
IN Reynolds...



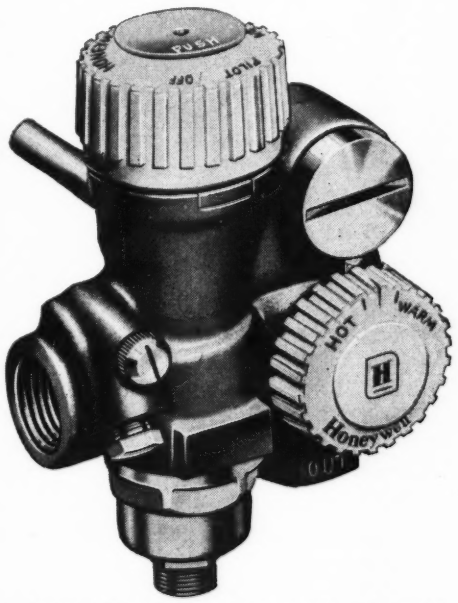
Accurate, Safe Control

of tremendous pressures is an ever present problem in the gas field. Reynolds field Regulator illustrated at left is one of the many high pressure regulators built by Reynolds. It is thoroughly tested and proved in service. It handles up to 1,000 pounds safely reducing same to pounds. For more than fifty-five years Reynolds has designed and built gas regulators. Safety, accurate performance, years of service—these are some of the built-in factors responsible for Reynolds enviable position in the Gas Control Field.

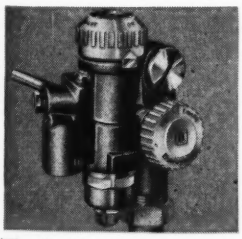


Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.
GAS CONTROL SINCE 1892

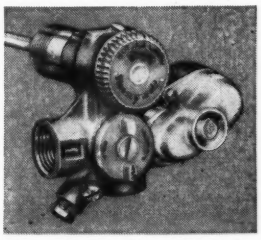
Why "Honeywell-designed" controls assure top gas water heater performance



The "20"—Model V-5120 is the star performer in this big new line of Honeywell water heater controls. It provides *complete 100% control* for natural, manufactured or LP gas! Main gas cock with pilot position, main burner pressure adjustment and the thermomagnetic pilot with 100% shut-off are all included in this compact control.



The "21"—V-5121 is designed to take up minimum space for use as a concealed control. It includes main gas cock with pilot position; main burner pressure adjustment; thermomagnetic pilot with 100% shut-off.



The "19"—Use V-5119 for natural or manufactured gas. (Not for LP gas.) Includes thermostat; main gas cock with pilot position; pilot adjusting screw; main burner pressure adjustment; thermomagnetic pilot.

Honeywell, world-leader in the manufacture of precision temperature controls, has applied all their control-making experience in designing these new gas water heater controls. They are made to maintain selected temperatures constantly; to light the burner safely and automatically; to provide "positive shut-off" in case of pilot failure.

These new Honeywell Controls are precision-made of fine quality materials and each is exhaustively factory tested to insure excellent performance when installed. This often helps reduce the number of service calls received for minor adjustments.

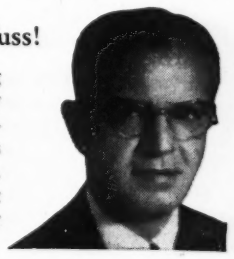
Also, you'll find Honeywell-equipped heaters have an extra sales feature, too! Prospects know the name Honeywell stands for quality and accuracy, and thus they're easier to sell!

So be sure to order Honeywell-equipped water heaters! Then watch these fast-selling, trouble-free models boost your gas water heater profits! Call your distributor or mail the coupon below.

MINNEAPOLIS **Honeywell**

First in Controls

Another extra! Styled by Henry Dreyfuss!



Look at the *sales appeal* the colorful, smart styling gives these new Honeywell Controls. Nationally famous industrial designer Henry Dreyfuss, working with Honeywell, helped make these controls a smart, attractive addition for any water heater. That's why Honeywell-equipped models reflect top quality at first glance—stand out from other models on the sales floor.

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Appliance Controls Division, 8775 Mettler Street, Dept. GS-8-144
Los Angeles 3, California

Please send me detailed information on your complete line of gas hot water heater controls.

Name.....

Address.....

City..... *Zone*..... *State*.....

examination of gas rate regulatory policy.

While no drastic modification of the commission's policy is likely for a time (and particularly until Harrington Wimberly's successor has had time to become acclimated), there nevertheless are reasons for thinking the new policy soon will become effective. FPC spokesmen heretofore have insisted that the "cost-of-capital" criterion used in three major rate cases does not represent a fixed policy on what the gas rate of return should be and that the decisions are made on a case-by-case basis.

Meantime, FPC has issued a notice of proposed rule-making to amend its Uniform System of Accounts for public utilities and licensees and natural gas companies to provide a new account for future income taxes as a result of fast tax write-offs. This is very good news, and many companies will have a chance to present oral arguments on Sept. 9, when hearings will begin. Interested parties have until Aug. 19 to submit their views and comments on the proposed amendment.

Sensational New Lancaster S-7

GROOVE TYPE*

METAL RIM DIAPHRAGM

Smoother meter performance . . . greater measuring accuracy . . . longer service periods . . . 95% to 100% O.K. meters . . . are now possible with this improved Lancaster *groove type* metal rim diaphragm.

Perfectly centered in its inward and outward travel . . . perfectly balanced with surprisingly low differential . . . wonderfully smooth, consistent performance are important advantages of this new Lancaster S-7 diaphragm for small meter repairs and replacements.

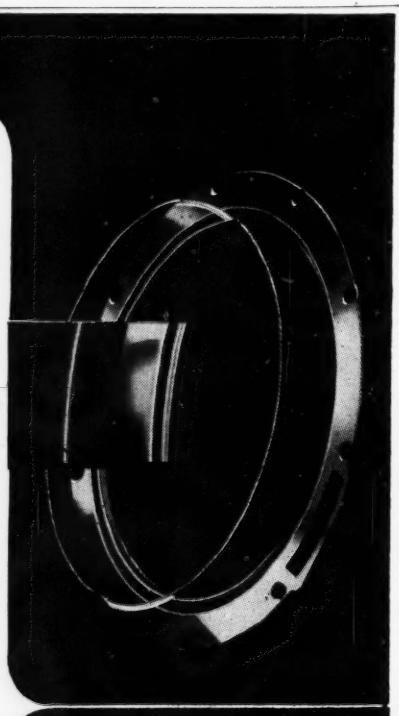
Write for literature and prices today.

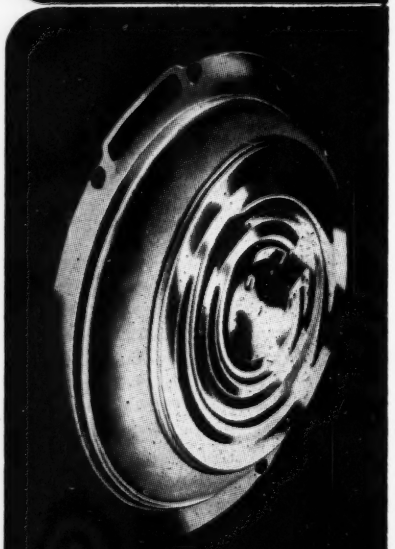
New Groove Type Metal Rim for greater rigidity and a perfect circle.

New Patented Endless Metal Tie Band for stronger clamping, more uniform depth of pocket.

New Improved Quality Rechrome Leather specially processed to Lancaster's own specifications.

*PATENT PENDING





METER PARTS CO.

Goodby to Morton

Oscar W. Morton's resignation as acting assistant deputy administrator of PAD has been accepted by Secretary McKay, and Mr. Morton has returned to the Panhandle Eastern Pipe Line Co., of which he is vice president. He is stationed, for the present, in the company's Washington office. He had been in charge of PAD's Gas Branch since April 1. He joined PAD as a consultant, and, in October 1951, was named assistant to the director of the Gas Operations Division.

Joseph A. LaFortune, of Tulsa, Okla., vice chairman of the board of the Warren Petroleum Corp. since 1952, and long-time official of the firm, has succeeded J. Ed Warren as Petroleum Administrator for Defense. He will serve, as did Mr. Warren, without compensation from Uncle Sam.

"For public convenience . . ."

The impropriety of overlooking reproduction costs of a public utility in determining rates has been pointed out by the Supreme Court of Illinois in overthrowing the state commission's decision in the Illinois Bell Telephone case.

The court reiterated a previous decision that "The basis of all calculations as to the reasonableness of rates . . . must be the fair value of the property being used . . . for the convenience of the public, and in order to ascertain that value the original cost of construction, the amount expended in permanent improvements, the present cost of construction . . . are all matters for consideration and are to be given such weight as may be just and right in each case."

Although the court declared "that it could not be laid down as a rule without qualifications that cost of reproduction new, less depreciation, is the only basis of valuation for rate-making purposes . . . it was equally true that the original cost of construction, less de-

Humphrey

RADIANTFIRES
RADIANTFIRE CIRCULATORS
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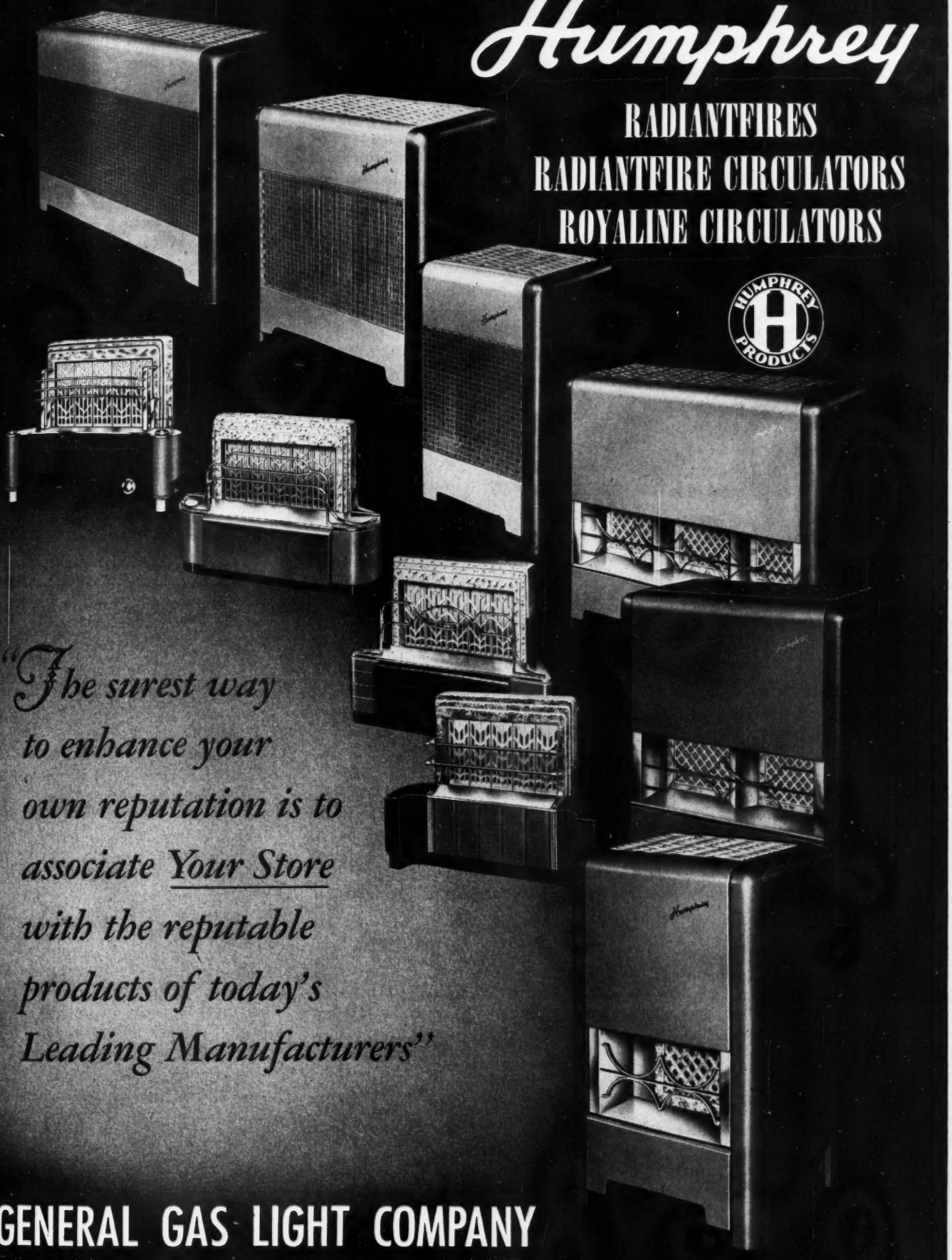


"The surest way to enhance your own reputation is to associate Your Store with the reputable products of today's Leading Manufacturers"

GENERAL GAS LIGHT COMPANY

KALAMAZOO, MICHIGAN

23 Warren Street, New York City

225 Eleventh Street, San Francisco

preciation, cannot be held to be the only proper basis . . ."

It concluded "that the commission committed error in failing to make specific findings of the element of reproduction cost new . . ."

Prideful pointing

Northeastern Gas Transmission Co., the New England pipeline firm, has had relations with its market that have suffered not one whit in comparison to those of its fellow companies in the Northeast. While others have been peering into shotgun muzzles, Northeastern has established an operation to which it can—and does—point with pride.

Recently, E. E. Miller, president of Northeastern, was able to report to the New England Assn. of Fire Chiefs that natural gas (that fearful monster) had saved hundreds of lives. In the four years preceding the arrival of natural gas, said Mr. Miller, 20 Massachusetts gas companies reported 239 deaths from inhalation of manufactured gas. In the two years since Northeastern introduced natural gas, there have been no deaths.

Such a pertinent example — and clinching proof — of the fact that high pressure pipelines can operate safely bears repeating — no, broadcasting.

New life for storage

The Kent bill, which would have restricted underground gas storage near working coal seams (*GAS*, May 1953, page 24), lost out in the Pennsylvania state senate committee after squeaking through the House by a single vote and is now dead until, at the earliest, early 1954. The swing has been toward opposition of the bill, so GAMA, which fought it with the weapons of public opinion, thinks similar legislation pending in Ohio and West Virginia will have even slimmer chances of passing. And Kentucky, says Managing Director Leigh Whitelaw, "unquestionably would have proposed a similar bill if the Kent bill had become law."

The new fighting GAMA, expertly counseled by its public relations firm, is a wonderful thing to watch in action. May it, and the rest of the gas industry, keep fangs bared until this ill-conceived measure is as unpopular as halitosis.

Incidentally, the Interstate Oil Compact Commission had already authorized formation of a committee composed of members from those states, plus Illinois and Indiana (which have similar problems), to study the situation. The compact could accomplish a lot of good if it would come up with a solution that would prove that public safety and the health of the gas heating business are compatible.

Sales mean miles

Properly designated utility sales supervisors, along with dealers and their salesmen, can get in on the summer Servel "Holiday Fare Campaign." The more refrigerators sold before Sept. 15, the farther the salesman can travel on his vacation trip at no cost for fare.

Dealers started off with a 300-mile bonus, to be added to at so-many-miles per refrigerator purchased. Utility men can qualify in this category. Dealer salesmen must sell a minimum of 10 units, for which they will be credited 1000 miles, and extra sales mean extra miles. Airline fare rates will be paid, but the credits may be used for any type of travel, or for hotel bills or meals, and may be split among several people.

HALFWAY AROUND THE WORLD...

with

CARBOSEAL

Trade-Mark

ANTI-LEAK

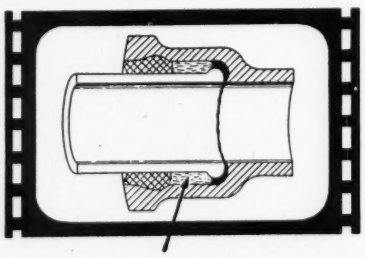
Distributors of dry gas have bought enough CARBOSEAL anti-leak to leak-proof 13,000 miles of 3-inch equivalent main. And the first bell-and-spigot joints treated with CARBOSEAL anti-leak—20 years ago—are still tight.

CARBOSEAL anti-leak is effective and lasting when unaccounted-for gas increases after changing over to a dry gas. It swells the fiber packing in a bell-and-spigot joint as much as 44 per cent of its dry volume. This swollen condition lasts, because CARBOSEAL anti-leak doesn't evaporate to any extent.

CARBOSEAL anti-leak is easy and economical to apply. You don't have to uncover every joint—just pour the anti-leak into graded mains at the high points, or spray as much as 300 feet of main from one opening with a hose and nozzle.

The cost of enough CARBOSEAL anti-leak to treat 1 mile of 3-inch equivalent main is about $100!

Get all the facts—write for our booklet, Form 4506.



SEE AND HEAR

. . . the whole story. Write today for our free 16 mm. color-sound movie that shows how two gas companies used CARBOSEAL *anti-leak.*

CARBOSEAL ANTI-LEAK

Carbide and Carbon Chemicals Company

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30 East 42nd Street UCC New York 17, N. Y.

In Canada:

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"Carboseal" is a registered trade-mark of Union Carbide and Carbon Corporation.

MORE MONEY FOR YOU from Automatic Gas Heating Sales

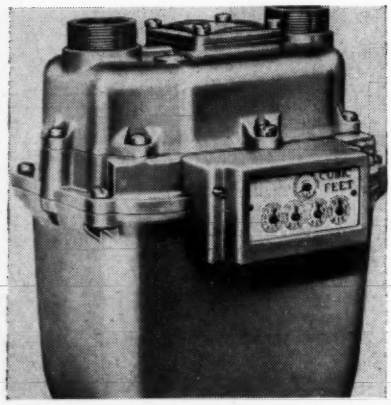
Pick up extra profits by selling Automatic heating with space heaters equipped with the new, streamlined *ROBERTSHAW®* 2-EC throttling type heat control. An adjustable by-pass set at the time of installation maintains a minimum flame over the main burner at all times, assures more even distribution of heat and continuous air circulation that helps overcome the "cold 70." Model 2-EC is equipped with a thermo-electric automatic pilot. Should pilot failure occur the magnet automatically releases and provides 100% shut off of all gas. *Write for full information.*

Robertshaw-Fulton
CONTROLS COMPANY

ROBERTSHAW THERMOSTAT DIVISION
YOUNGWOOD, PENNSYLVANIA

New Products and Trade Literature

To secure further information on products or new literature, simply fill out the coupon and mail, indicating by number the information or literature needed.



1 Aluminum Meter

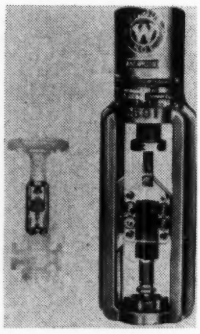
A new aluminum version of its standard No. 1 gas meter has been introduced by Rockwell Manufacturing Co. Weighing only 22 lb as compared with the standard, which weighs 45 lb, the new meter has been designed to offer increased ease in handling and setting, reduction in shipping costs, and greater resistance to weather and shock.

It has a pressure cast aluminum body, which offers added protection against the weather. Tested at 10 psi, the meter has a rated capacity of 5 psi, and a maximum capacity of 275 cu ft per hour (at ½-in. pressure drop with 0.60 sp gr gas).

The new meter is available with offset swivels for 10 light meter bar installations.

Rockwell Manufacturing Co.

2 Regulating Valve

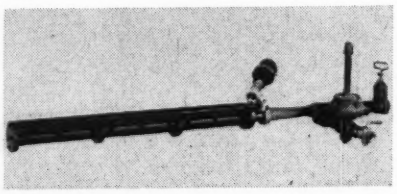


The Thomas Magna-Stroke, a new development in regulating valve design, introduced by Natural Gas Equipment, is available in all types of NGE Wilgus regulating valves. Magna-Stroke is a gear train working at a ratio of 2:1, giving twice the stroke at the inner valve as at the diaphragm.

Fluids, gas vapors, or liquids which are to be maintained automatically at a desired pressure within a close limit can be maintained at half the variation due to Magna-Stroke action of doubling the pressure effect.

Natural Gas Equipment Inc.

■



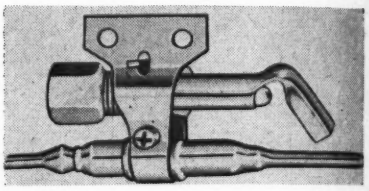
3 Line Burner

A gas-fired retention-type line burner for applications where heat must be distributed over a wide area by a continuous flame is now in production by Eclipse Fuel Engineering. Oven heating, kettle heating, and air heating installations, including make-up air systems for spray booths, are some of the applications.

Of blast-burner design, the new burners may be installed to fire in any direction: horizontally, vertically, or downward. Each cast iron section is equipped with drilled and matched flanges so they can be bolted together for a wide variety of continuous flame patterns. An adapter flange is available for applying either a blast or atmospheric pilot and flame failure protection equipment.

Eclipse Fuel Engineering Co.

■

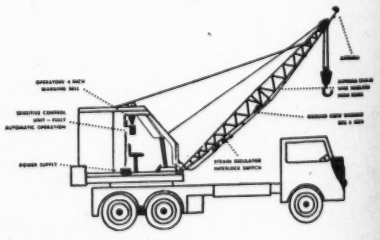


4 Target Pilot

The new non-aerated 2B target pilot introduced by Grayson Control Div. has been test proven, showing freedom from linting and clogging. It has no ports or burner tube to clog. The manufacturer states that the target pilot will maintain a stable flame on appliance applications with draft conditions in excess of AGA limits. It has automatic air control, no air shutter. The slip-out orifice is removed by simply breaking one connection. Stainless steel is featured.

Grayson Controls Div.

■



5 Warning Device

An automatic electric warning device, the Alarmeter, has been introduced for use on

Mail this Coupon

for NEW PRODUCTS INFORMATION

COPIES OF NEW LITERATURE

GAS, 198 S. Alvarado St., Los Angeles 57, Calif.

8/53 Fill in numbers of items in which you are interested.

No. ..... No. ..... No. ..... No. .....

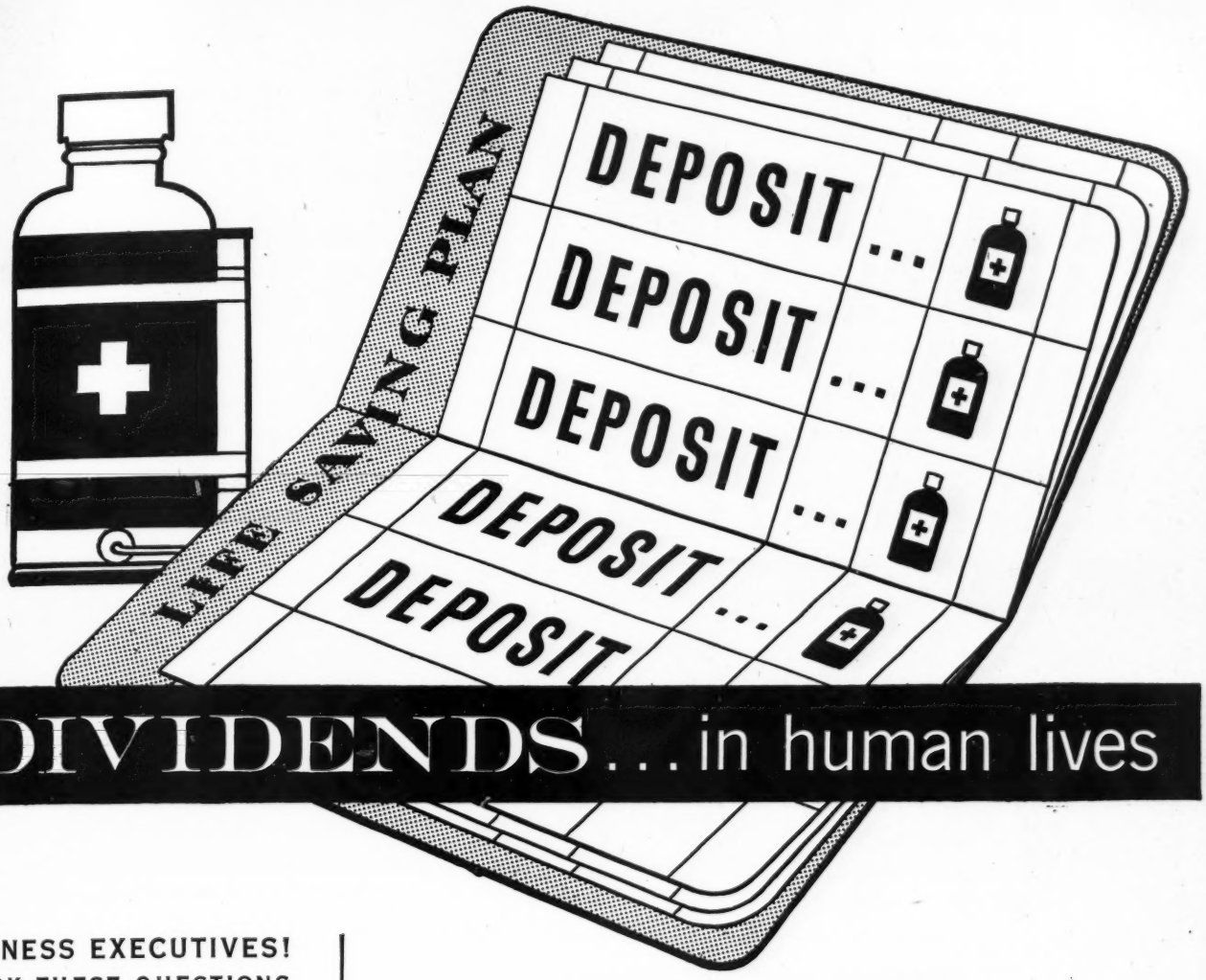
No. ..... No. ..... No. ..... No. .....

NAME AND TITLE.....

FIRM'S NAME.....

ADDRESS.....

CITY.....ZONE.....STATE.....



DIVIDENDS... in human lives

BUSINESS EXECUTIVES!
CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ○ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ○ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
- ○ DO YOU HAVE A BLOOD DONOR HONOR ROLL IN YOUR COMPANY?
- ○ HAVE YOU ARRANGED TO HAVE A BLOOD-MOBILE MAKE REGULAR VISITS?
- ○ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ○ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ○ WAS THIS INFORMATION GIVEN THROUGH PLAN BULLETIN OR HOUSE MAGAZINE?
- ○ HAVE YOU CONDUCTED A DONOR PLEDGE CAMPAIGN IN YOUR COMPANY?
- ○ HAVE YOU SET UP A LIST OF VOLUNTEERS SO THAT EFFICIENT PLANS CAN BE MADE FOR SCHEDULING DONORS?

Remember, as long as a **single** pint of blood may mean the difference between life and death for **any** American . . . the need for blood is **urgent!**

NATIONAL BLOOD PROGRAM

America's blood bank needs **more** blood, **now**. Be a regular depositor and know that your dividend is saving a life of some American—somewhere.

It may be a soldier shot down in battle, suffering from **shock.** Or someone here at home, sick and in dire need of new blood to restore life. A mother in childbirth, or a child in an accident.

America must give. America is **you**. Won't you call your Red Cross, Armed Forces or Community Blood Donor Center right now, for an appointment?

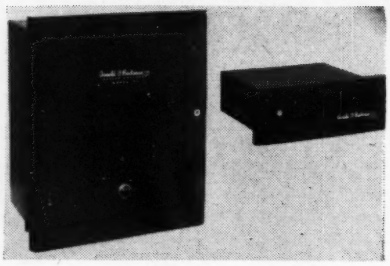
GIVE BLOOD

...give it again and again

all boom equipment to give the operator the fullest measure of safety while working near energized lines. In order to avoid confusion with other horn signals, bells were installed. Not only will the bell sound when the boom is too close to lines, it also rings continuously when one of the parts becomes inoperative for any reason.

Features include protection of the full length of the boom; fault-proof simplified electronic safety interlocked circuits; fully automatic operation; compact size (control unit is 3 by 10 by 5 in.). The unit can be operated either by battery power pack or from power supply of the rig.

armeter Sales Co.



6 Oxygen Analyzer

A new unit has been added to the line of oxygen analyzers manufactured by Arnold O. Beckman. Model F3 indicates the oxygen content of process gas automatically and, when used to sample a natural gas pipeline, it will monitor the process stream continuously and accurately, warning by means of alarm whenever the oxygen content exceeds safe limits. In gas manufacturing, the analyzer is suited for maintaining high standards of purity.

The Model F3 measures the magnetic susceptibility of gas by physical principle. The instrument is unaffected by gases other than oxygen. Accuracy is 1% of full scale for spans of 5% and greater.

Arnold O. Beckman Inc.

■

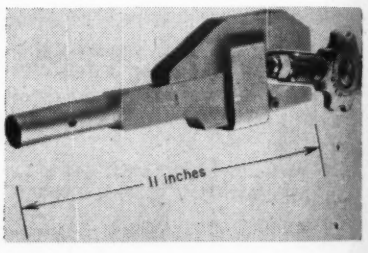
7 Tamper

Augmenting the Gunderson-Taylor standard Triplex backfill tamper line is the new Super Triplex (Model GT-RV-4). Particularly suitable for tamping backfill under severe conditions, the Super is 20 to 30% faster than the standard model and imparts 40% heavier impact and more vibration to soil being compacted. Its effective compaction area is 90 to 100 sq in.

The new model offers 40% more power than the Standard without loss of blows per minute (2100). It compacts to the same density, but with substantially higher lifts.

Gunderson-Taylor Machinery Co.

■



8 Valving Wrench

Designed specifically for inserting valves in cylinders, an adjustable valving wrench has been announced by Superior Valve & Fittings Co. The wrench, which can be used easily by one man, is useful for the small repair operation where automatic valving equipment is not available.

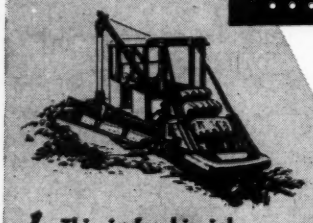
The handle can be fitted with two adjustable jaws. It is necessary to attach a 1-in. steel pipe extension to the wrench; the length will govern the amount of torque applied.

Superior Valve & Fittings Co.

It takes a FULL team

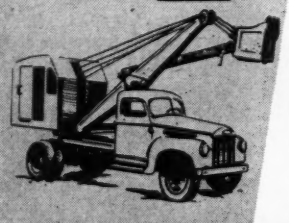
. . . whether it's a barber shop quartet

. . . or digging equipment



1. This is for big jobs

2. This is for medium jobs



3. Sherman for all other jobs

On many excavating jobs the use of big equipment is costly and time-consuming. The Sherman Power Digger is designed so that you get all the advantages of power digging on these jobs. Thousands of users have proved that the Sherman Power Digger reduces costs. Write today for descriptive literature J4.

Designed, Engineered and Manufactured Jointly by

SHERMAN PRODUCTS, Inc.
Royal Oak, Michigan

WAIN-ROY CORPORATION
Hubbardston, Mass.

•

Patent No. 2,303,825
Other patents pending

Sherman
PRODUCTS, INC.
ROYAL OAK, MICHIGAN
Sherman SP Products

HIGH PRESSURE STATION REGULATOR

NO BLEED OF PILOT LOADING GAS TO ATMOSPHERE

Features

1. Pilot loading pressure balanced principle of operation develops fast, accurate, stable control.

2. Up to 2″ inner valve travel for extreme high capacity requirements.

3. High rangeability with inlet pressures up to 600 psi and outlet pressures from 1 to 250 psi.

4. Bodies available in high-tensile iron or cast steel in sizes 2″ to 10″.

5. Unit available with top and bottom guided inner valve for severe pressure conditions, or composition "O" ring disc inner valve for absolute tight shut-off.

6. Spring closed construction insures positive inner valve action under all conditions.

Performance

The Fisher Type 880 is an ideal town and border station regulator that promotes *precise* and *stable* metering.

It will be found of great value for *high pressure* loop lines and *high pressure* distribution stations where dependability is absolutely essential. Bleeds *no* gas to the atmosphere, can be installed in pits or other locations subject to flooding by venting breather opening of pilot diaphragm to a level above flood stage.

Loading Pilot

Sturdy compact Type 62 loading pilot is the same that has been used for years on the famous Fisher King Booster.

WRITE FOR BULLETIN — P880

• • Marshalltown, Iowa

FISHER

Since 1880

BETTER GAS PRESSURE CONTROL

Trade Literature

9 Honeywell Catalogs

Two new catalogs are available from Minneapolis-Honeywell. (When ordering copies, use letter preceding description together with number of this notice.)

(a) Catalog 8950 describes, illustrates, and provides specifications for a wide variety of accessories for pneumatic control applications. Data on control piping systems and the computing of air capacities are also included.

(b) Catalog 7001 is a 32-page bulletin describing many types of pressure and vacuum gauges used to measure vacuums as great as 10-11 mm of mercury and pressures as high as 150,000 psi. Covered are indicators, recorders, pneumatic and electric controllers, and pneumatic transmission. Information is presented in tabular form for ready reference.

Minneapolis-Honeywell Regulator Co.

■

10 Pocket Guide

A 50-page pocket guide to Airco electrodes has just been published by Air Reduction describing more than 30 different electrodes. Also included are suggestions for ways to pick the right electrode, mechanical properties and testing of electrodes, and AWS-ASTM specifications.

Air Reduction Co.

■

11 Titrilog Folder

Consolidated Engineering Corp.'s Titrilog is described in a new four-page folder. Both cabinet and portable models are described and such applications in the natural gas industry as the evaluation and treatment of gas for removal of H_2S and in odorization practices are outlined.

Consolidated Engineering Corp.

■

12 Air Conditioning Booklet

"Fourth Dimension of the Modern Home" is a 20-page, four-color booklet produced by Servel to help the public understand air conditioning in the light of recent advances. Stressing the advantages and importance of an "ideal indoor climate"—a home's "fourth dimension"—the booklet describes Servel's all-year air conditioning.

Servel Inc.

■

13 Burner Tip Bulletin

Standard Alco burner tips are described in a new bulletin published by American Lava Corp. A special order service, which makes burner tips and heads to any design, is described and physical characteristics are given on gas burner tips, radiant burner heads, carbon black tips, pilot tips, spuds, caps, removable discs and rings.

American Lava Corp.

■

14 Instrument Bulletin

American Recording Chart Co. describes its complete line of gas gravitometer instruments in a new bulletin just issued. Featured is the new recording gas gravitometer, which may be used for either recording transmitting or for recording controlling. Principles of operation as well as lists of all pertinent information helpful to engineers and purchasing agents are included.

American Recording Chart Co.

■

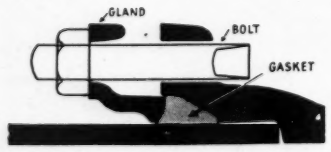
15 Two-Color Bulletin

Ingersoll-Rand has published a two-color bulletin describing the company's new compressors for the transfer of liquefied gas. Construction is described by means of a sectional drawing. A typical installation problem is solved and a practical unloading problem is worked out. Graphs indicate capacity of the various machines under different pressure conditions.

Ingersoll-Rand Co.

PIPE LAYER'S
MAGIC WAND!

RATCHET WRENCH IS ONLY TOOL NEEDED TO LAY McWANE-PACIFIC BOLTITE MECHANICAL JOINT PIPE



Boltite pipe is used for water, gas, steam, oil, chemicals and other liquids. Gaskets are rubber compound, asbestos, duck tipped, and other materials for special services.

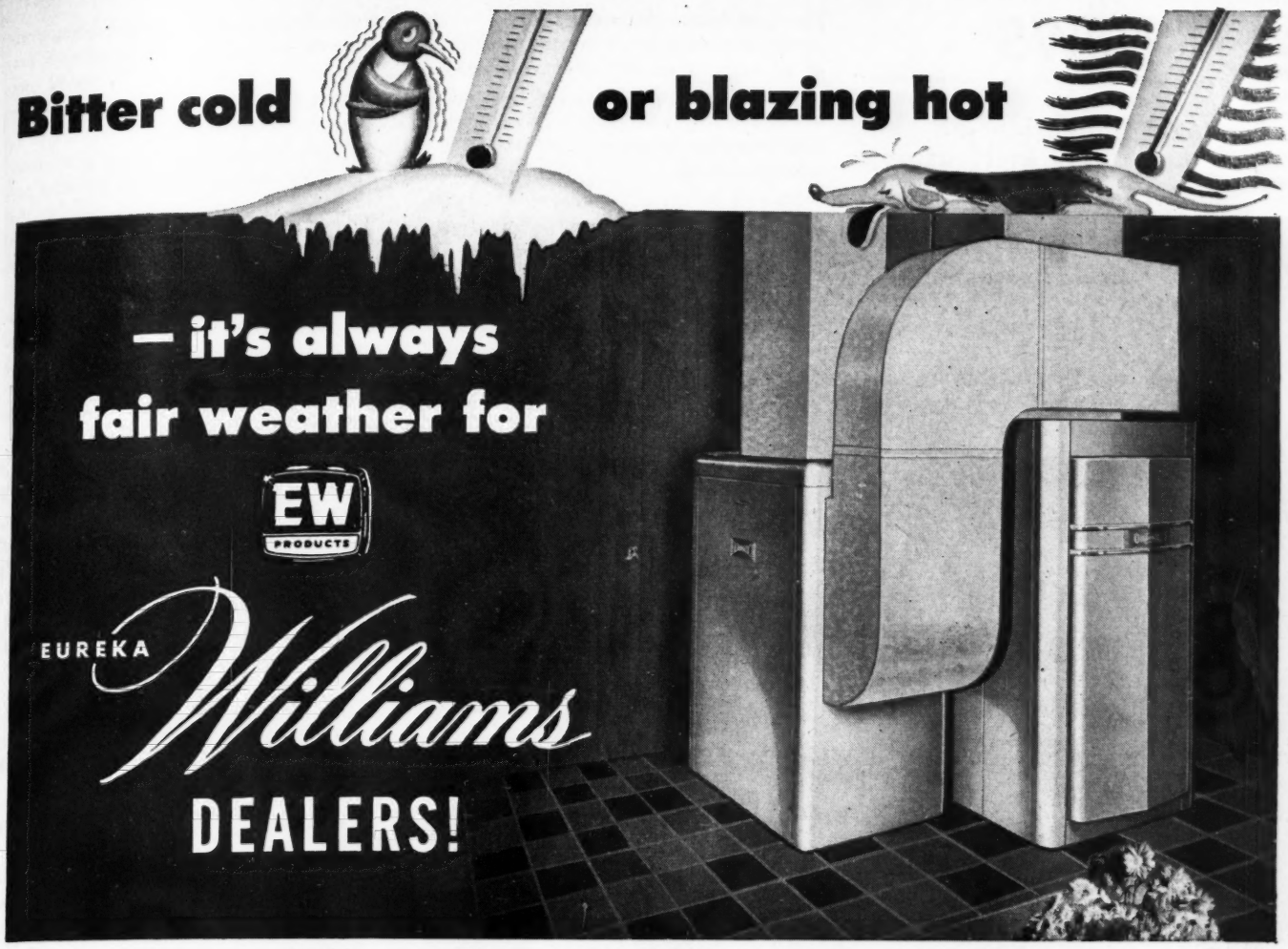
There's magic in a ratchet wrench when you lay McWane-Pacific "Boltite" Mechanical Joint Cast Iron Pipe. A ratchet wrench is the only tool needed for one man to make "Boltite" joints. He simply slips the follower-ring and the gasket over the spigot end, then sockets the pipe, inserts the gasket into the stuffing box and bolts up the follower-ring for a bottle-tight, flexible joint. McWane-Pacific Boltite pipe is furnished in 18-foot lengths. The follower-ring, gasket and bolts are interchangeable with any make of standard mechanical joint pipe. For further details, write

McWANE Cast Iron Pipe Company
Birmingham, Ala.
Pipe Sizes 2" thru 12"

Sales Offices
Birmingham 2, Ala.....P. O. Box 2601
Chicago 1, Ill.....333 North Michigan Ave.
New York 4, N. Y.....80 Broad Street
Kansas City 6, Mo.....1006 Grand Avenue
Dallas 4, Texas.....3200 Maple Avenue

PACIFIC STATES Cast Iron Pipe Co.
Provo, Utah
Pipe Sizes 2" thru 24"

Sales Offices
Provo, Utah.....P. O. Box 18
Denver 2, Colo.....1921 Blake Street
Los Angeles 48, Cal.....6399 Wilshire Blvd.
San Francisco 4, Cal.....235 Montgomery St.
Portland 4, Ore.....501 Portland Trust Bldg.
Salt Lake City.....Waterworks Equip't Co.
Seattle, Wash.....Smith Tower Bldg.

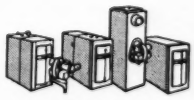


FOR YEAR 'ROUND PROFITS... SELL YEAR 'ROUND HOME COMFORT

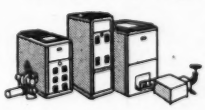
with Eureka WILLIAMS oil heat, gas heat, air conditioning

There's no need to let the weatherman cloud your profit-horizon with seasonal selling slumps . . . not if you're a Eureka *Williams* dealer. Eureka *Williams* products cover the home comfort market completely . . . all year 'round . . . with the finest in dependable, low-cost heating and cooling. Regardless of climate, or customer preference, you need never pass up a profitable sale. Whether it's oil heat or gas heat, summer or winter air conditioning, a complete unit or a conversion burner . . . you have the product to fill the bill. What's more, that product is backed by one of the oldest names in automatic home heating: Eureka Williams, a leader in *your* business for over 30 years.

Write today for full facts about the Eureka *Williams* franchise . . . it'll mean hot sales and clear profits . . . no matter what the season.



OIL-O-MATIC Home heating — with exclusive *Metered Low Pressure*. Complete line for homes of all sizes—for all types of heating systems.



GAS-O-MATIC Home Heating—with exclusive *Metered Flow Pressure*. Models for homes of every size and type.

AIR-O-MATIC Home Cooling—latest member of the famed Williams family. Installed with Oil-O-Matic, Gas-O-Matic or existing forced warm-air heating system to provide year 'round air conditioning at very low cost.

EW PRODUCTS

Williams Division

Eureka Williams Corporation • Bloomington, Illinois

In Canada: Williams Oil-O-Matic of Canada, Ltd., Guelph, Ontario

Better Products, Better Made *for better living!*

Williams Division • Eureka Williams Corporation
Bloomington, Illinois

Please send me full facts about new year 'round profit opportunities with the *Eureka Williams* Franchise.

NAME_____

FIRM_____

ADDRESS_____

CITY_____ STATE_____ GM-8

NEWS

Cathodic protection job gets under way in Houston

Construction started on one of the largest packaged cathodic protection jobs ever undertaken when field crews of Cathodic Protection Service, Houston, recently began the installation of several thousand magnesium anodes in the city of Houston's gas distribution system.

The contract awarded to CSP by the city amounts to $134,500 and covers the complete preliminary engineering survey, completion of the detailed design and furnishing of all labor, materials, installation equipment, final checking, testing and adjustment of currents and potentials to provide complete protection to the underground gas distribution system.

Most of the city's 250 miles of mains and laterals are either bare or very poorly coated; however, a large percentage of the service lines are relatively well coated. Some sections of the system where corrosion has made repair impractical will be replaced with new pipe concurrently with the application of the cathodic protection as part of the rehabilitation program. The balance of the system is still capable of withstanding operating pressures and can be cathodically protected at far less cost than the cost of complete replacement.

Although the investment appears to be disproportionately large for cathodic protection, CPS engineers estimate that the payout is less than two years and point out that in the late 1930's the city spent $140,000 and in 1947 $40,000 for replacement of service lines only because of corrosion. The percentage of unaccounted-for gas during the last few years has been extremely high and at present gas costs are calculated to amount to almost $40,000 a year. This figure is expected to be reduced by at least 75% when the new work is completed.

Many of Houston's service lines are tied into the mains by means of couplings, a large percentage of which are open circuit. Normally the cost of locating and excavating to these couplings to bond them, especially under concrete, would be almost prohibitive. However, CPS has developed a new technique of "shorting" these open circuit joints electrically without excavation.

ARCCO
The World Over
—wherever there is gas
ARCCO-ANUBIS
'Dry-Air GAS
GRAVITOMETERS
This new Arcco-Anubis Dry Air Gas Gravitometer determines and records specific gravity of gases automatically corrected to the humidity content of the air. The difference in weight between a column of GAS and equal column of DRY AIR is measured. This ratio represents the true specific gravity of the sample.
One bell of the instrument is filled with gas which is being measured, and the other bell is filled with dry air. Otherwise, except for the new instrument having one column for gas and one column for dry air, the unit is identical in operation to the standard gas gravitometer. When calibrated and properly installed, these instruments require little attention other than to wind the clock, ink the pen, and change the chart. Send for bulletin No. 101.
AMERICAN
RECORDING CHART CO.
3113 E. 11th St. • Los Angeles 23, Calif.
Available for Early Delivery
SEND FOR BULLETIN No. 101R2

Stock purchase plan sells 105,148 shares to employees

During a month-long stock offering, employees of Philadelphia (Pa.) Electric Co. subscribed for 105,148 shares of common stock in the company under an employee stock purchase plan which ended last month. "This far exceeds our most optimistic expectations," said R. G. Rincliffe, president of the company.

Subscriptions were received from 2902 employees and annuitants, representing more than one-third of the employee body. Stock was offered to employees through a payroll deduction plan approved by stockholders of the company at their annual meeting in April.

"Oscar of Industry" sought by 47 gas companies

Forty-seven gas companies are candidates for "Oscars of Industry," annual report award made by *Financial World*, investment publication, as a result of their annual reports being chosen for merit awards in the preliminary judging.

A total of 1923 industrial corporations and financial institutions reached the finals, compared with 1658 cited a year ago. In its 13th international competition, the national weekly magazine rated a total of 5000 annual reports. For the first time the companies cited with merit awards and honorable mentions totaled 2942, or almost 60% of the 5000 rated.

During the summer an independent board of judges will consider the merit-rated annual reports to select the best in each of 100 industrial classifications. The initial review of the qualified annual reports will be handled by a screening committee of pro-

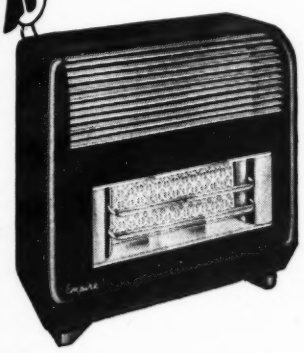
What Stopped Her?

THE *New Empire* Gas HEATING APPLIANCES

GAS FLOOR FURNACE

NO BOOM!
NO BANG!
NO TICK!

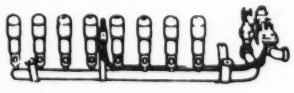
IT'S COOL!
IT'S COOL!



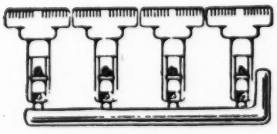
GAS COOL CABINET
RADIANT CIRCULATOR
HEATER

When you think of the comfort the new Empire Gas Heating Appliances give . . . the convenience they add . . . and, the time, trouble, and expense they save . . . it's easy to see why folks speak so glowingly in their praise. For here are heating appliances that are easy to install, and simple to operate. They do not require complicated adjustments or costly servicing. It's no trouble at all to keep them clean.

GAS RECESSED
WALL UNIT



THE FAMOUS



Gas
BURNERS

SILENT AS A KITTEN
WITH AN EXTRA SET
OF FOOT PADS

"Thriftmatic"

EMPIRE

STOVE COMPANY

BELLEVILLE, ILLINOIS

WORLD'S LARGEST MANUFACTURER OF *Gas* FLOOR FURNACES

fessional investment analysts.

Winners of the bronze Oscar-of-Industry trophies in 100 industries, as well as for the best annual report advertisements and post-meeting reports, will be announced in October.

Gas companies that qualified for the final judging are:

Alabama Gas Corp., Arkansas Western Gas Co., Atlanta Gas Light Co., Brooklyn Union Gas Co., Chattanooga Gas Co., Columbia Gas System, Commonwealth Natural Gas, Consolidated Gas Utilities, Consolidated Natural Gas, Duquesne Light, East Tennessee Natural Gas, El Paso Natural Gas, Empire Southern Gas Co., Equitable Gas Co.

Hartford Gas Co., Honolulu Gas Ltd., Houston Natural Gas, Kansas-Nebraska Natural Gas, Laclede Gas Co., Lone Star Gas Co., Lynchburg Gas Co., Minneapolis Gas Co., Minnesota Valley Natural Gas, Mississippi River Fuel Corp., Mobile Gas Service Corp., Mountain Fuel Supply, National Fuel Gas Co., North Shore Gas Co., Northern Natural Gas Co., Oklahoma Natural Gas Co., Pacific Lighting Corp., Peoples Gas Light & Coke Co., Portland (Ore.) Gas & Coke Co., Portland (Maine) Gas Light Co.

Providence Gas Co., Rio Grande Valley Gas, Shamrock Oil & Gas, Southern Natural Gas, Southern Production, Southern Union Gas, Southwestern Development Co., Springfield Gas Light, Union Gas System, Union Gas of Canada, United Gas Corp., United Gas Improvement, and Washington Gas Light Co.

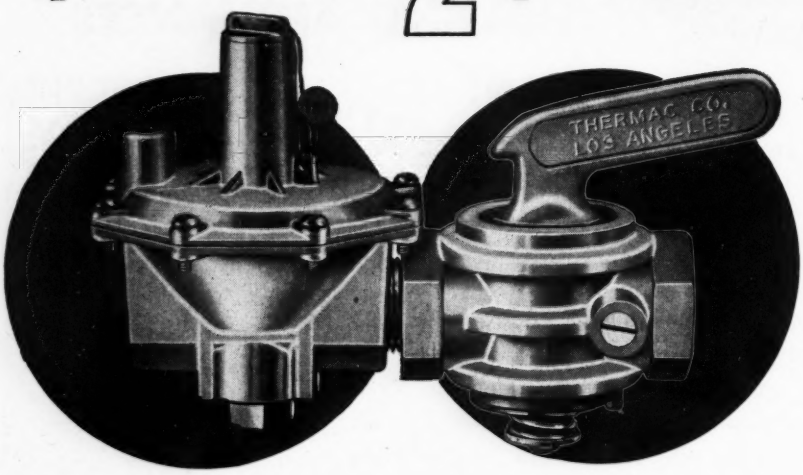
Gas companies' TV show attracts 400 employees

The "Blue Flame Revue," a television show sponsored by Southern California and Southern Counties Gas Co.'s in cooperation with major gas appliance manufacturers, played to a packed house recently when the utilities' employees attended the show for the special "Gas Company TV Party." Featured star of the show was Roberta Linn, who was recently named "favorite female vocalist" in *Tele-Views* personality poll.

The 400 tickets for the special showing vanished almost immediately after they were made available. In order to alleviate the disappointment of those not able to get tickets for the first party, blocks of 100 seats were reserved for two subsequent shows.

The weekly Blue Flame Revue has been going since April and is presented in the name of the gas appliance dealers of southern California.

Thermac NOW offers you these 2 products



APPLIANCE REGULATOR

Here's the famous Thermac "T" Series Regulator used on millions of gas appliances. Use it now in conjunction with the THERMAC Main Gas Shut-Off Valve.

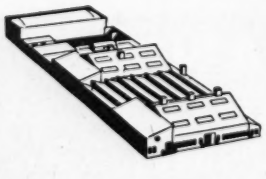
1. Lower cost per BTU capacity
2. Greater BTU capacity per size
3. Small octangle body easy to install
4. Greater diaphragm sealing area prevents leaks

GAS SHUT-OFF VALVE

Costs considerably less yet it is 2 to 3 times stronger and greater in capacity than ordinary gas control valves. This new Thermac valve, made of special high tensile aluminum alloy long proved in aircraft practice won't gall or stick. Valve rotor is treated with a hard facing and special long life lubricant. Pilot gas take-off may be provided on either side.

Appliance manufacturers are invited to request samples and quantity prices.

Use Thermac Regulators and Shut-Off Valves together for greater economy.



THERMAC HM COMPANY

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AGE sells division to Bryant Industrial Products

The newly organized Bryant Industrial Products Corp. of Cleveland has purchased the principal assets and production facilities of the Bryant Industrial Div., Affiliated Gas Equipment Inc., and will specialize in the design, production, and marketing of industrial gas combustion equipment.

According to President Robert M. Buck, all key personnel of the former AGE division will join in the new organization. Plans for the immediate future include expansion of present product lines and the development and introduction of several new lines, as well as broadened engineering and sales activities.

Other officers of the new company are Lawrence R. Foote, vice president, and John Sellors Jr., secretary-treasurer.

Ohio companies will add 1446 householeating accounts

According to a report made last month by the Ohio Fuel Gas Co. to the public utilities commission, a total of 1446 additional applications for gas householeating will be approved in Ohio. These approvals result from the report that operating companies of the Columbia Gas System outside of Ohio had connected that number of additional space heating customers between May 1 and 31.

Of the 1446, Ohio Fuel approved 680; Cincinnati Gas & Electric, 301; and Dayton Power & Light Co., 266. The latter two companies are wholesale customers of Ohio Fuel. The remaining 199 spaceheating units will be approved by 24 other companies and towns served wholesale by Ohio Fuel and two other affiliate companies of Columbia operating in Ohio.

The commission in an order issued following an April hearing on natural gas supply, directed that the Columbia companies in Ohio, and companies supplied by them, approve applications for householeating equal to the number of such customers that had been added by Columbia companies outside of Ohio.

Ohio Fuel's report to the commission showed that 929 had been added in Penn-

sylvania, 288 in West Virginia, 174 in New York, 43 in Kentucky, 12 in Virginia, and none in Maryland.

Following the first report made by Ohio Fuel on June 1, a total of 5509 applications were approved in Ohio.

"Baby yourself" headlines gas clothes dryer campaign

The AGA is going to tell the nation to "baby yourself" in a summer promotion and advertising campaign featuring automatic gas clothes dryers. The fast-selling, prestige-building dryers will be featured in the campaign wrapped around babies—and directed at adults who once were babies. The drive will emphasize modern gas dryer low-cost installation, low-cost operation, and high-speed drying.

Last year sales of gas dryers rose beyond the half-million mark. According to a leading appliance company spokesman, 800,000 dryers will be sold this year and he further predicts that gas dryer sales will be leading this field within two years. The number of manufacturers making AGA-approved dryers has increased from seven in January 1951 to 14 at present.

Promotion materials include a portfolio, broadside, display kit, a "Big 10" booklet, and sales manual. Several unusual promotion pieces can be used in local sales activities by salesmen and dealers. Tailor-made direct mail campaigns can be based on a set of four baby greeting cards specially designed by Constance Bannister.

Among special suggested plans is a hostess party, based on the "use the user" practice. The display kit will emphasize the baby idea. "You'll Be in Clover 10 Times Over With a New Automatic Clothes Dryer" relates the dryer story in eight succinct colorful pages which can serve as sales floor giveaways, direct mail pieces, or in home calls.

New Columbia movies tell of economic struggle

Columbia Gas System's two latest motion pictures were premiered recently during the series of employee meetings held by the group companies. Like "The Legend of Dan and Gus" (*GAS*, October 1952, page 41), the newest films talk economics, but unlike last year's production, the new films were made with "live" actors.

"Protest" is set in a community where a committee of citizens is meeting to investigate a proposed gas rate increase. Most of the committee members feel that a raise in gas rates would be harmful to the community and are ready to place such a feeling into a resolution protesting the raise when the gas company turns the tide of opinion by showing how higher company expenses without compensatory rate increases can be detrimental to gas service.

The second movie, "A Case for Two Wit-

THE NORMAC
BELL JOINT CLAMP

A SIMPLE SOLUTION for one of the GAS INDUSTRY'S *most trying problems*

Solves Your Joint Repair Problems • Quick • Easy • Permanent

Installed in small pavement openings. Available in all standard sizes from 3" to 12". A simple set of tools cleans the joint, installs the clamp . . . often in only a quarter of an hour. SAVES TIME. SAVES MONEY and the repair is permanent. Designed for all conditions particularly where pavement repair costs are prohibitive. Such small opening repairs are scarcely noticeable when pavement is replaced.

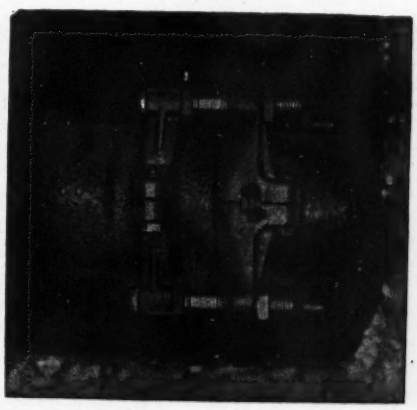
Normac Clamps can be installed in large as well as small openings.

Norton-McMurray hold definite leadership in the development of methods for installation and rehabilitation work through small openings. We welcome the opportunity to help solve a problem you may have—tell us about it.

Write for our catalog describing our complete line of

COUPLINGS . . . FITTINGS . . . SERVICE TEES and ELLS . . . SLEEVES . . . COMPRESSION-END COCKS . . . METER BARS and BRASS FITTINGS for copper pipe.

6 inch Normac Clamp being lowered into hole for installation



6 inch Normac Clamp in service after installation

NORTON-McMURRAY MFG. CO.

122 SOUTH MICHIGAN AVENUE • CHICAGO 3, ILLINOIS

Method and product covered by U. S. Patents, Nos. 2,163,261 and 2,178,286.

nesses," was made primarily to illustrate how inadequate gas rates affect employees and stockholders. In a hearing before a regulatory body, two witnesses, the stockholder and the employee, whose story is seldom told at rate hearings, show the rate regulators that a utility has an obligation to its employees and stockholders as well as to its customers.

Lone Star not responsible in 1948 gas explosion

Under a decision by the third court of civil appeals, Lone Star Gas Co., Dallas, will not be required to pay personal injury and property damages caused by a 1948 explosion from a gas leak in a Travis county farm house.

An opinion by Chief Justice Roy C. Archer said the plaintiffs had failed to allege in their pleadings that the company had exclusive control of the equipment involved, or that its workmen had access to the house, or the company had supervision of a stove which figured in the explosion.

Utility and dealer program for closer liaison ready

Availability of the 8-unit packaged dealer sales program, designed to assist gas utility companies attain closer liaison with the dealer, has been announced. Prepared by the dealer sales committee of the AGA residential gas section, the program features the "Pattern for Profit" theme.

The program has as its major objectives: to assist utilities increase the effectiveness of load-building activities by achieving a strong local dealer appliance merchandising program; and to provide utilities with a definite and well documented plan of action, together with the materials to secure, develop, and train an effective dealer gas appliance sales organization at the local level.

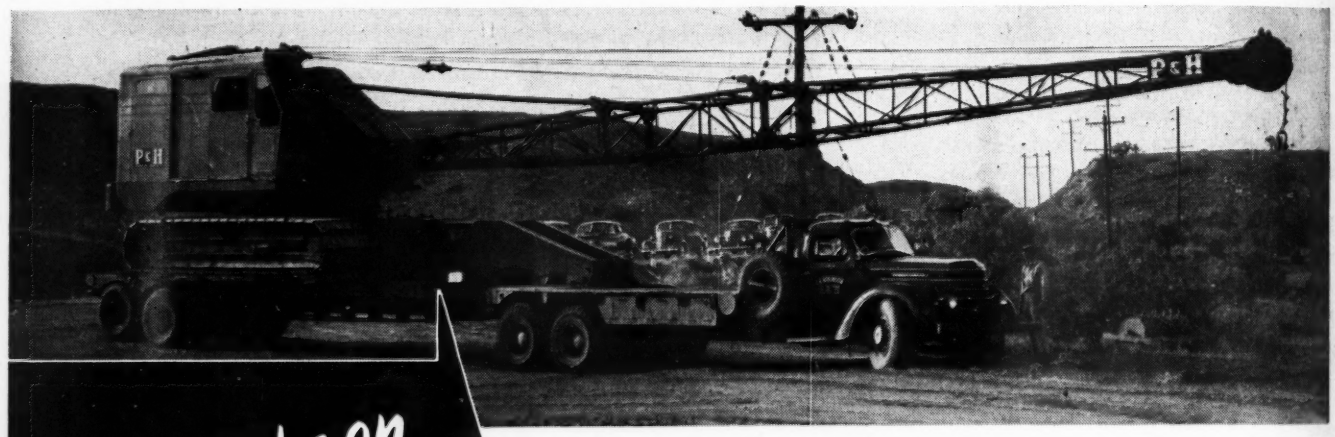
Two publications aimed at the utility, "Deal in the Dealer" and "How to Win Dealers and Influence Customers," accompany the material for distribution to dealers, which includes an illustrated booklet, "Buy-Ways to Profit," and a dealer sales training course.

American Meter Co. President William G. Hamilton Jr. cuts the ribbon at the formal opening of the company's new plant in Nebraska City, Neb., while Mayor Bremmer (left) and Arthur F. Benson, vice president-engineering, look on. The new plant, situated on a 12-acre site, adds 48,000 sq ft of space devoted to displacement meter production.

Heating equipment shows greater proportional gain

Although for years more ranges, water heaters, room heaters, and floor and wall furnaces have been operating on gas than on any other fuel, a six-year summary compiled by GAMA shows the use of gas for central heating systems has increased in greater proportion than any other type.

Gas central heating systems, which only since the war have gained wide acceptance because of the spread of natural gas pipelines, were behind oil systems in sales during the six-year period, with oil units numbering 4,202,200 and gas 3,590,600. It was pointed out, however, that gas central heating systems actually "in use" jumped from 2,300,000 in 1947 to 5,371,000 in 1952, a gain of 3,071,000, while the gain in use of



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To get equipment where it's needed, when it's needed, safely and efficiently, is no longer a major problem with contractors . . . they rely on Tulsa Winch to do the job. Whether you're moving power shovels or light timbers, there is a Tulsa Winch for every make and model of truck and crawler tractor in capacities from 6,500 to 80,000 lbs.

Tulsa* Winch
TULSA, OKLAHOMA DIVISION OF VICKERS Inc.

*Reg. U. S. Pat. Off.

oil was from 3,651,000 to 6,292,000, up only 2,641,000. Coal stoker systems dropped from 1,186,000 in 1947 to 1,061,000 at the end of 1952.

Gas direct heating units—those used to warm single rooms or small areas—also topped those using other fuels. The tally shows 11,790,020 gas; 9,284,100 oil or other liquid fuel; and 6,274,200 coal and wood units sold from 1947 through 1952. Sales of gas floor and wall furnaces exceeded those using oil by more than 2 million. Gas unit sales totaled 2,844,200 as compared with 498,900 for oil.

The report also shows that 14,853,100 gas ranges have been sold during the past six years as compared with 8,156,000 electric. During the same period, 12,066,800 gas water heaters and 5,390,000 electric storage water heaters were sold.

Output to be doubled by Standard Magnesium

Construction of a new plant for the production of magnesium anodes by Standard Magnesium Corp., Tulsa, will double the company's present operation and output. According to President Roger Wheeler, the new foundry area will include three concrete and steel buildings and from 50 to 60 people will be employed compared with 40 in the present plant.

Floor space in the new buildings will total 20,000 sq ft and it is hoped that the two plants can produce 4 million lbs of magnesium per year. Several new processes will be employed at the new location.

Special news editions herald executives' visits

Each year the top executives of the Columbia Gas System, Chairman of the Board Stuart M. Crocker and President George S. Young, meet with 200 to 300 key people in each of the System's operating group's headquarter cities to discuss progress during the past year and outline problems facing the system in the future.

This year the first gathering was in Charleston, W. Va., on June 23. On subsequent days meetings were held in Columbus, Ohio, and Pittsburgh.

A special edition of each group's employee magazine is published immediately after the meeting and mailed to employees' homes. In this way all 11,000 employees scattered over the seven-state area served are informed of the proceedings.

Detectron Co. opens new plant in Los Angeles area

The first phase of a long-range expansion program was completed recently when the Detectron Co. announced opening of its new factory in North Hollywood, Calif. In addition to doubling production capacity of the

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Look for the wrench with that guarantee label to make sure you get the extra-easy work and extra durability that have made RIDGID the world's most popular wrench.

Only RIDGID assures you a hookjaw that always rides freely in the housing; adjusting nut always spins easily to pipe size. Replaceable alloy jaws won't slip or lock on pipe. Handy pipe scale on hookjaw. Safe stout comfort-grip I-beam handle.

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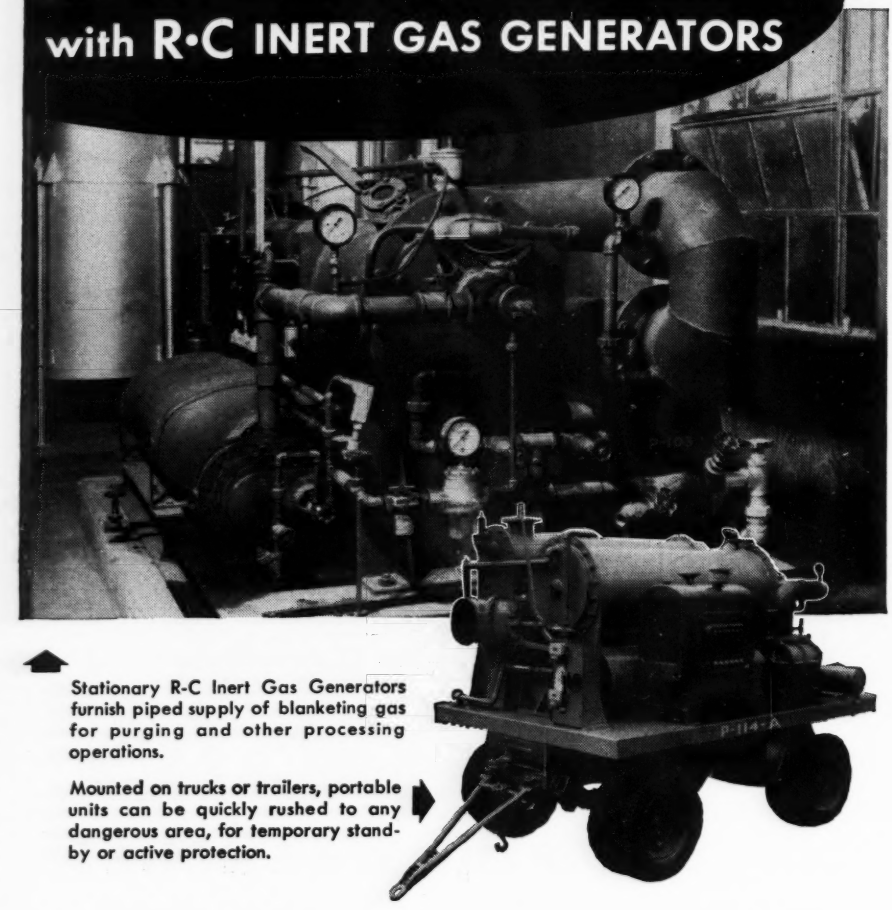
RIDGID

Work-Saver Pipe Tools

REDUCE EXPLOSION RISKS with R·C INERT GAS GENERATORS



Stationary R-C Inert Gas Generators furnish piped supply of blanketing gas for purging and other processing operations.

Mounted on trucks or trailers, portable units can be quickly rushed to any dangerous area, for temporary stand-by or active protection.

Where materials or processes may cause explosion-produced fires, such hazards can be greatly lessened by stand-by R-C Inert Gas Generators.

From stationary or portable units, a continuing flow of inert gas will blanket dangerous areas or can be used for purging explosive gas or liquid lines. Using either oil or gas as fuel, they operate at very low cost. Frequently, the comparatively small investment can be absorbed by more favorable insurance rates.

Units are available in capacities from 1,000 cfh to 50,000 cfh, with characteristics to match specific requirements. Write for details on how your fire and explosion risks may be reduced with R-C Inert Gas Generators . . . built by the specialists in equipment to handle gas and air.

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Exclusive Specialists in Handling Gas and Air

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company's line of scientific measurement and detection equipment, the modern, one-story building will provide greatly enlarged research and development facilities.

Completely modern throughout, the new plant features air-conditioning for both factory and offices and scientifically planned lighting that assures the high efficiency required in the production of precision instruments. Additional adjoining property has been acquired with an eye to future expansion plans.

News notes

Public service commission authorization has been granted the National Fuel Gas Co., which already owns Iroquois Gas Corp., to buy Republic Light, Heat & Power Co., both of Buffalo, N. Y. (See July *GAS*, page 80.)

An application has been filed with the Securities & Exchange Commission by Michigan Consolidated Gas Co., Detroit, for authorization to borrow $20 million from seven banks. The loan would serve as temporary financing of the company's construction program pending formulation of permanent financing. A single bid submitted for the $20 million of first mortgage bonds which it put up for sale at competitive bidding was rejected as unsatisfactory by the company.

Niagara Mohawk Power Corp. received PSC permission to extend its natural gas system into the town of Bethlehem, Pa., and expected to complete construction of the 2.2-mile line from Albany into the communities of Elsmere and Delmar late last month. Lines to other parts of the town will be installed at a later date.

Thirty-five sons and daughters of Allis-Chalmers people will be in college next fall under the company's scholarship plan, which has been in operation since 1949. Eleven new scholarships were awarded this year, while the others received renewals of their $500 scholarships. For the first time, contributions of $500 will be given to each private educational institution attended by the honored students. Under the program, it is possible for each student to receive $2000 in educational assistance while completing four years of college study.

Brooklyn (N. Y.) Union Gas Co. is decreasing gas rates to 35,000 househeating customers in Brooklyn by 4 cents per Mcf. The rate reduction, which has received PSC approval, will about offset the monthly increase of 65 cents to $1.53 granted recently after the FPC had approved higher wholesale rates.

Voluntary contributions totaling almost $8000 have been made by Lone Star Gas Co. employees throughout Texas and Oklahoma to the tornado relief funds for Waco and San Angelo (see July *GAS*, pages 34-

35). Prior to the latest contributions, Lone Star had already sent special relief checks to the disaster areas.

Milwaukee (Wis.) Gas Light Co. has requested the Securities & Exchange Commission to authorize a bank loan agreement of $9 million with six banks. The company estimates it will spend about $5.6 million for construction this year, of which approximately $1,850,000 has already been spent, and about $6.2 million in 1954.

Natural gas utility sales to ultimate consumers in May totaled 4286 million therms, a gain of 16.5% over sales of 3679 million last May. The AGA's May index of total gas utility sales is 169.2% of the 1947-1949 average. For the 12-month period ending May 31, utility gas sales totaled 54,375 million therms, an increase of 8.8% over the previous cumulative period.

Hamilton Manufacturing Co., Two Rivers, Wis., has redesigned its 1954 dryer in order to make it a part of the "companion piece" automatic home laundry, which will feature the dryer and the brand new automatic washer. The matched units have been styled by industrial designer Brooks Stevens. Three new conventional washers are also being produced by Hamilton this year.

A step to clarify the entire regulatory situation in Colorado was taken recently when citizens of Denver, a "home rule" city, voted to adopt an amendment to the charter of the city and county of Denver which would place the regulation of privately owned utilities under the public utilities commission

One hundred years from now citizens of Kankakee, Ill., will exhume a "time capsule" buried by today's residents and find messages, documents, and photographs picturing the city during its centennial celebration in 1953. The capsule is a specially adapted 80-gal. Permaglas water heater contributed by A. O. Smith Corp. Waldo W. Higgins (left), chief engineer of the Permaglas division, watches John Krueger dropping documents into the capsule.

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FAST, SAFE, ECONOMICAL

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- Reinforcement of woven glass textile fabric.
- Strip separator sheet to prevent sticking in rolls regardless of temperatures.
- Excellent bond to adjacent coating and pipe.
- Conveniently applied to full 3/32 inch thickness.
- No waste of bituminous material.

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ENGLEWOOD, COLORADO

TRY DRESSERTAPE*

Spin uniformly perfect protection on run of pipe with this portable tool.

Fast, easy, effective CORROSION PROTECTION!

No matter who does the job, *all* your underground pipe and joints can now have *full, permanent protection* against corrosion. Dressertape—the high dielectric plastic tape—is the answer. Any crew can master the easy application techniques in minutes, save expensive man hours and cut over-all costs on every job. Try Dressertape yourself!

LOOK AT THESE OUTSTANDING DRESSERTAPE ADVANTAGES!

- Uniform coating—top, bottom and sides.
- Easy, clean to apply—sticks at a touch, no heating equipment required.
- Safe to use—no burns, no fumes.
- Conforms to irregular surfaces—especially over fittings on service lines.
- Immediate backfill—no waiting.
- Exceptional electrical properties—dielectric strength: 10,000 volts; insulation resistance: 100,000 megohms.
- Lasting protection against water, oil and soil chemicals—equal to, or exceeding, yard or mill-wrapped pipe.
- Available in widths from ¾" to 6".

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of the state. The PUC already had such regulatory powers except in home rule cities. A proposal to create a separate board of utilities commissioners to regulate utilities within the city and county failed to get the approval of voters.

FPC reports that operating revenues of natural gas companies reporting to it totaled $205,067,212 in April, a 22.5% rise over April 1952 receipts. For the 12 months ended April 30, revenues aggregated $2,090,074,650, or 19.1% higher than the $1,754,379,097 received in the 12 months ended April 30, 1952. Sales to residential and commercial consumers decreased 0.9% and 2.0%, respectively, in April, while those to industrial consumers increased 11.8%. Revenues from the three classes increased 7.7%, 6.7%, and 22.9%, respectively.

In a move to bring about more efficient operation, the general offices of the United States Pipe & Foundry Co. were moved last month from Burlington, N. J., to Birmingham, Ala., the major producing area of the company. U. S. Pipe also announced that on the first of this month the Sloss-Sheffield Steel & Iron Div. of the company was consolidated with the general office departments and will no longer operate as a separate division.

Abstracts

THE SELECTION AND OPERATION OF GAS-FIRED LEHRS (Information Letter No. 54 prepared by the glass and ceramics processing subcommittee of the AGA's industrial and commercial gas section).

Annealing in modern gas-fired lehrs is one of the most important operations in the art of glass making. This process, the design and operating requirements of lehrs, decorating and bending glass, and the economics of lehr operation are described.

Many innovations have been made to meet the increasing necessity for improving existing methods of fuel application with a view to offset in some measure the general advance in manufacturing costs. Prominent among these is the advance made in the understanding and the full use of annealing principles.

DESIGN, CONSTRUCTION, AND INSTRUMENTATION OF A MOBILE RESEARCH LABORATORY FOR THE PETROLEUM AND PETROCHEMICAL INDUSTRIES—This paper, by Raymond C. Baird, Fluor Corp., Los Angeles, was presented at the PCGA gas supply and transmission conference held in Santa Barbara, Calif., May 13-14.

The design, construction, and instrumentation of a mobile research laboratory used for making field measurements in acoustics, vibration, and pulsative fluid flow are discussed, with special reference to the instrumentation involved and the range of its capabilities. The effect on design resulting from

several years' operating experience with an earlier mobile laboratory is shown.

Installations, equipment, and activities with which operation of such a mobile research laboratory may be associated are described and illustrated. An article by Ray C. Sollars, also of the Fluor Corp., entitled "Mobile Laboratory for Testing Performance of Pulsation Dampness in Compressor Stations" appeared in the February 1950 issue of *GAS*.

FORMULAS AND GRAPHS FOR REPRESENTING THE INTERCHANGEABILITY OF FUEL GASES—By Elmer R. Weaver.

When gas-burning appliances have been adjusted to give satisfaction with a gas of one composition, and are then supplied with gas of a different composition, changes are usually noted in the characteristics of the flames produced. When no change can be seen or measured, the gases are said to be "exactly interchangeable." When undesirable changes do not occur to a greater extent than the person using the term thinks permissible, the gases are usually still called "interchangeable" with the omission of the adverb. No entirely satisfactory method has ever been found for predicting or representing the extent to which different gases depart from exact interchangeability.

In this paper a set of six "indexes" is given for specifying and predicting from the composition of any two fuel gases the extent of the effects that occur when one is substituted for another. Four of these indexes are new. Their derivation is given, and their application is shown by comparison with the results of extensive experimentation of the American Gas Assn. They are shown to represent the results of observation somewhat better than any method previously proposed.

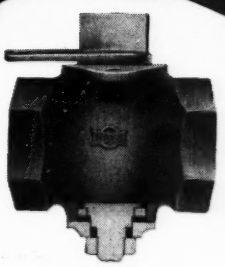
This Research Paper 2193 has been prepared by the National Bureau of Standards and is available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for 25 cents per copy.

NATURAL GAS VS. COAL AND OIL IN THE BRICK INDUSTRY — Information Letter No. 55, prepared by the glass and ceramics subcommittee of the AGA's industrial and commercial gas section, presents information to justify the use of gas for firing bricks in many sections of the country since the consumer described in the Pittsburgh area finds it practical to burn gas, even though ample coal is located on his own property.

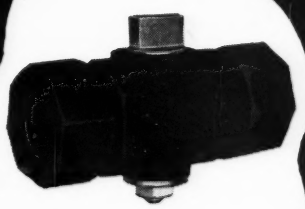
Conversions to natural gas from both coal and oil fuels are discussed. Heating operations in brick production begin with drying to remove water from the moist molded shapes. After drying, they are successively "water-smoked," oxidized, and vitrified. These three higher temperature operations —known as brick burning—require much heat, and total potential gas consumption is substantial.

IT PAYS TO BUY HAYS that are TOPS

7405
Iron Body, Galvanized,
Bronze Plug Stop



7490
"Key-Lok" Tamper Proof Stop
Lockwing—Iron Body,
Bronze Plug



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Threadless Gas Stop
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Service Line Stops—Meter Stops
Appliance Stops

Tamper Proof and Standard Patterns

Iron Body with Brass Plug
Black or Galvanized
Also All Brass Stops

Flat Head—Flat Head with Lockwing

Full Range of Sizes

Quality Assured . . .
By Precision Machining—
Individual Testing—
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Quality Proven . . .
By Supplying the Gas Industry
for Over 80 Years

Standard Packaging for Easy Handling,
Space Saving Storage . . : Another HAYS First

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GAS SERVICE PRODUCTS
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People

Promotions

After more than 35 years in the gas industry, C. E. BENNETT has retired as chairman of the board of the Pittsburgh Group of Columbia Gas System. The former president of the AGA and vice chairman of the association's laboratories had served the Columbia organization since 1920 when he was vice president and general manager of Binghamton Gas Works and other subsidiaries, moving up to their presidency in 1931. He became president of the Pittsburgh Group in 1935, serving in that capacity until last December, when he became chairman of the board.

Several new officers have been elected by the Pittsburgh Group. S. M. CROCKER and H. E. OLSON are members of the board of Natural Gas Co. of West Virginia, Cumberland & Allegheny Gas Co., Binghamton Gas Works, the Keystone Gas Co., and Home Gas Co.; C. H. GOETZ is a director of Binghamton, Keystone, and Home Gas; DANIEL J. EGAN and JAMES E. COLEMAN are the new vice presidents; and DONALD H. MELANEY is the new assistant secretary of each of the companies.

E. M. Toussaint
Honeywell

C. E. Bennett
Pittsburgh Group

R. R. Newquist
Roots-Connersville

J. H. Brinker
A. O. Smith

E. M. TOUSSAINT has been appointed general manager of the appliance controls division of Minneapolis-Honeywell Regulator Co., with headquarters in Los Angeles. JOHN E. HAINES, vice president, will now devote full time to the commercial division. JOHN HUFF is assistant general manager under Mr. Toussaint.

Pacific Gas & Electric Co., San Francisco, has promoted ELMER E. STRAND to gas superintendent of the company's Stockton, Calif., district and has named DANIEL A. ROTHENBUSH, district foreman, to succeed him as assistant division gas superintendent at Stockton.

THEODORE W. WEIGELE, vice president and engineer of Michigan Consolidated Gas Co. and its affiliate, American Natural Gas Co., retired last month after 39 years with the American Natural Gas Co. system. He began his career with the Public Service Co. of New Jersey in 1913 as a cadet engineer, joining Michigan Consolidated as superintendent of Station A in 1919. He became a vice president in 1948 and held his present position since 1950.

STUART V. WILLSON, executive vice president of Northern States Power Co. of Wisconsin, has been elected president, succeeding GLEN V. RORK, who is retiring. Mr. Rork remains as a member of the board of directors.

WILTON L. BROWN is the new purchasing agent of the Peoples Gas Light & Coke Co., Chicago; EDWARD F. TOUSSAINT will serve as his assistant.

ROBERT T. HLAVIN has been promoted to sales manager of the gas valve division of Detroit Brass & Malleable Co., Detroit.

E. K. WILKINS has been promoted to general construction manager of Ebasco Services Inc., New York.

RALPH R. NEWQUIST, executive vice president, is the new president and general manager of the Roots-Connersville Blower Div. of Dresser Industries Inc., succeeding R. H. OWENS, who becomes chairman until his retirement later this year.

The former assistant executive in charge of distribution, J. H. BRINKER, has been appointed director of marketing of the A. O. Smith Corp., Milwaukee.

J. T. KELLEY has been elected vice president and general manager of Pittsfield (Mass.) Coal Gas Co., succeeding FRANK A. WOODHEAD, who is retiring.

Sharples Chemicals Inc., Philadelphia, has promoted FRANK P. MAXEY to chemical products manager, in charge of sales promotion for fuel gas odorants.

W. D. VIRTUE, vice president and secretary, has been elected treasurer of Public Service Co. of Colorado, Denver, succeeding D. G. GUINEY, who will retire Sept. 1 H. A. MITCHELL, assistant secretary and treasurer, will take over as secretary to fill the vacancy created by Mr. Virtue's resignation from that office.

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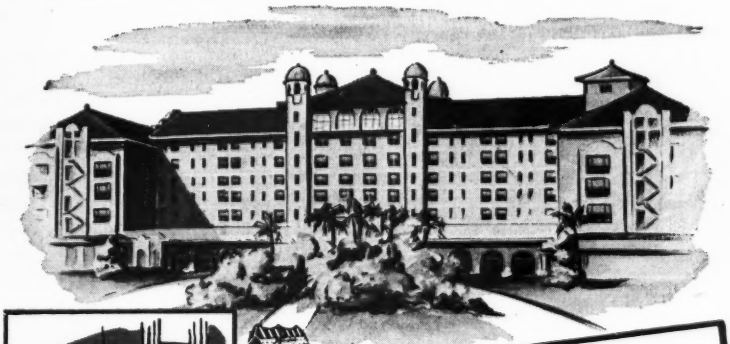

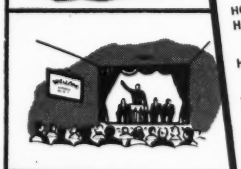

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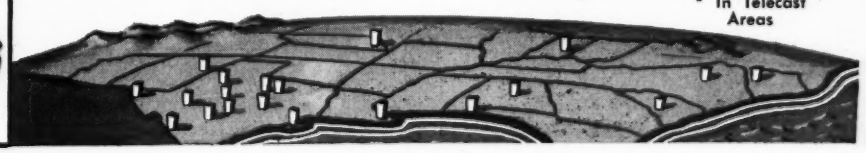

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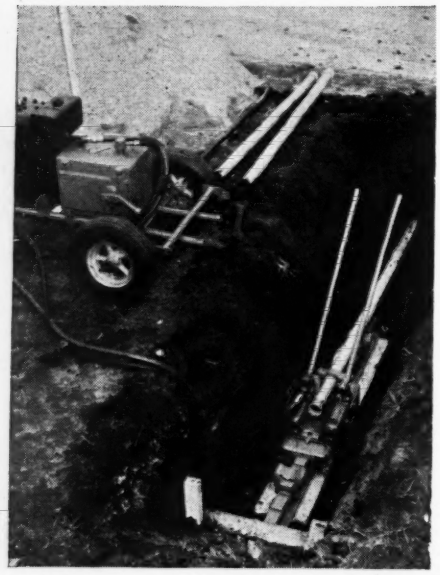
AT LOWER COST



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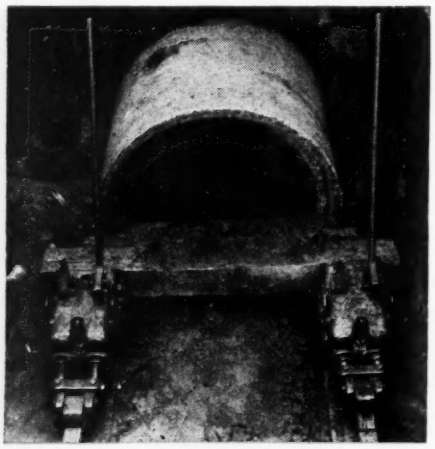
Here's the simple, cost-cutting way to install underground pipe. Speed your jobs with a GREENLEE Pusher. One-man-operated, portable, simple to operate. No tearing up of pavement . . . eliminates extensive ditching, tunneling, backfilling, tamping, repaving. Cuts job time to a fraction. GREENLEE Hydraulic Pipe Pusher often pays for itself on first job. Two sizes — model shown above for pushing 3/4" to 4" pipe. Larger unit, below, for pipe over 4", concrete sewer pipe and large drainage ducts. Power pump (as shown above) also available for extra ease and speed of operation.



GREENLEE

Write today for descriptive literature. Greenlee Tool Co., 1948 Columbia Ave., Rockford, Ill., U.S.A.

A. B. Cates Jr.

H. C. Hammond

Southern California

A. B. CATES JR. has been promoted to assistant controller and H. C. HAMMOND to manager of the accounting department for the Southern California Gas Co., Los Angeles. Mr. Cates was formerly general auditor and Mr. Hammond was his administrative assistant. As the result of the retirement of Construction Engineer W. R. SHETTEL, Supervising Engineer E. E. ELLIS will be reported to by the supervisors of communications, contract construction, maintenance and shops, and design and project engineers.

As general sales manager for Arkansas Western Gas Co., THAD W. ROWDEN JR. will head a reorganized sales department under which will come the sale of all domestic, commercial, and industrial gas in the areas served by Arkansas Western. He has been with the company for the past 20 years.

DONALD C. COOK, former SEC chairman, is vice president and assistant to the president of American Gas & Electric Service Corp., New York.

MARTIN H. PARKINSON is now executive vice president of the United Gas Improvement Co., Philadelphia. EDWARD H. SMOKER was elected vice president, succeeding FRED B. HOFFT, who retired July 1. ROBERT S. WILLIAMS succeeds Mr. Parkinson as comptroller.

EARL SMITH has been succeeded as president of South Jersey Gas Co., Atlantic City, by THEODORE H. KENDALL, formerly executive vice president. Mr. Smith will remain as a member of the board. ALBERT W. CONOVER, president of Equitable Gas Co., Pittsburgh, has been elected chairman of New Jersey's board of directors.

R. A. Sproat

R. T. Marshall

Eureka-Williams

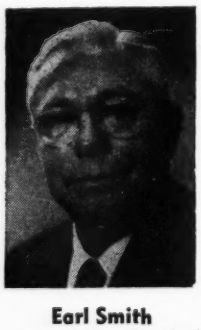
Eureka Williams Corp., Bloomington, Ill., has named R. A. SPROAT to the post of assistant treasurer. R. T. MARSHALL, newly appointed sales manager of the southern division, headquartering in Dallas, will have a territory composed of southern California, New Mexico, Arizona, Texas, Oklahoma, Mississippi, Alabama, South Carolina, Georgia, Louisiana, Arkansas, and Florida, and as a field representative, HOWARD HAUG, with headquarters near Pittsburgh, will cover Maryland, Ohio, Pennsylvania, and West Virginia.

WILLIAM F. BROWN, consulting geologist, and JOHN G. STAUDT, executive vice president of Dowell Inc., Tulsa, have been named directors of Brazos Oil & Gas Co., Houston subsidiary.

M. MILO MILLETTE is now works manager at the American Car & Foundry Co.'s Buffalo (N. Y.) plant.

Arkansas-Louisiana Gas Co. has announced the following promotions in its southern division: L. T. SHELTON, from acting sales promotion supervisor to sales promotion supervisor; J. R. ELLIOTT to acting sales supervisor for the Shreveport district; and JOHN BRADEN succeeding Mr. Elliott as acting sales supervisor in the Texarkana district.

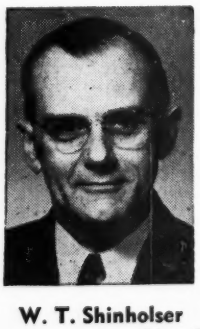
WILBUR T. SHINHOLSER has moved to Washington, D. C., as a vice president of the Columbia Gas System Service Corp. and, as a result, PAUL W. ROGERS has been promoted to the post of chief engineer of the Ohio Fuel Gas Co., Columbus. EDWIN L. MCCOY, reporter and columnist for the *Columbus Citizen,* has joined Ohio Fuel's information department.



Earl Smith

T. H. Kendall

South Jersey Gas



W. T. Shinholser

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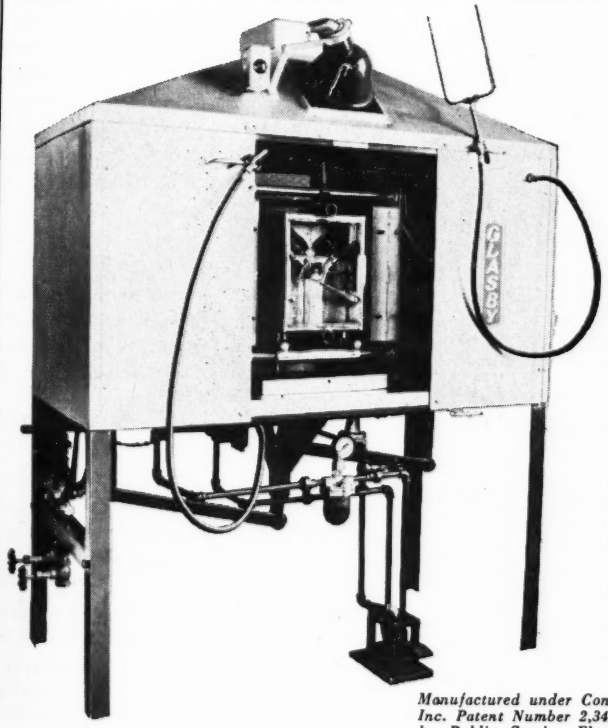

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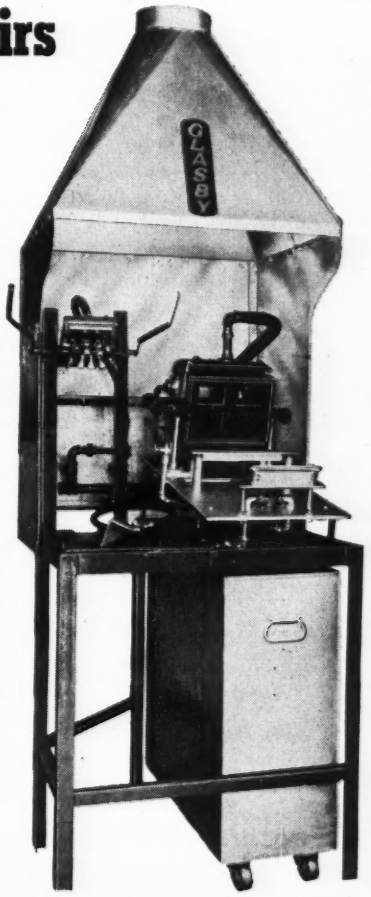
← Meter Front and Back Removing Machine

This machine removes the front and back from gas meters in a fraction of the time previously required thus facilitating repair of diaphragms. Two models available — 5 light meter and 10 light meter capacity. Both models are adjustable to most makes of meters and feature additional safety devices to protect the operator.

Meter Top and Valve Box Cover Removing Machine →

This machine facilitates the removal of meter tops and valve box covers to minimize the time-consuming problems of meter repair operation. Available in 5 light meter and 10 light meter sizes, both adjustable to most makes of meters. Both models feature devices for the safety of the operator.



Manufactured under Consolidated Edison Company of New York, Inc. Patent Number 2,342,045. Application development assistance by Public Service Electric and Gas Company of New Jersey.

THE J. P. GLASBY MFG. CO. INC.
BELLEVILLE 9, NEW JERSEY — *Manufacturers of Glasby Conversion Burners and Furnaces*

ROBERT M. MILNE, formerly general auditor for the Columbia Gas System, New York, has been named vice president of the Columbia Gas System Service Corp. HARRY C. DAVIES advances to general auditor.

DARWIN S. BROWN, a vice president since 1943, has been elected a member of the board of directors of Cincinnati (Ohio) Gas & Electric Co. Officers elected include WALTER C. BECKJORD, president and chairman of the board; ERNEST S. FIELDS, vice president and treasurer; WALTER E. BECKJORD, secretary; GEORGE F. BRENNER, DARWIN S. BROWN, SAMUEL M. HAMILL JR., J. REED HARTMAN, WALTER R. KEAGY, MILTON J. PFEIFFER, FRED R. RAUCH, and C. MAYNARD TURNER, vice presidents. EDWIN FINK and ALLEN C. STRUNK are assistant secretaries, and RAY E. BACHUS, J. PAUL O'BRIEN, WALTER J. OTT, and CLAUDE YORK are assistant treasurers.

COLIN W. RAFF, director of publicity and advertising, is now executive assistant to officers of Montana Power Co., Butte.

NATHANIEL F. GLIDDEN of New York has been re-elected chairman of the Washington Gas & Electric Co., Tacoma, Wash. Other officers re-elected are ALLEN PEYSER, Seattle, president; KEHL P. FISHER, Tacoma, vice president; GEORGE L. SCHOFIELD, Tacoma, vice president; and C. LOUIS FLEMING, Tacoma, secretary-treasurer. RENO ODLIN, A. M. CHITTY, WILLIAM F. MOORE, HERBERT D. MARSHALL, FREDERICK C. RUMMEL, Mr. Glidden and Mr. Peyser were re-elected directors.

DONALD B. VAIL has been elected assistant vice president of Commonwealth Services Inc., New York.

Changes in motor truck district management of the motor truck division of International Harvester Co., Chicago, include: CHAUNCEY L. SEARS to manager of the Harrisburg operations, succeeding M. H. ROTH, who has been transferred to Seattle in a similar capacity; J. H. BAKER to manager of the Columbus, Ohio, office.

F. V. Snodgrass
Rockwell

Frank Fiedler
Thermac

Rockwell Manufacturing Co., Pittsburgh, has announced reassignment and promotion of three plant managers. FLOYD V. SNODGRASS has been appointed to a special administrative post involving supervision of production and operations at the Oakland (Calif.) and the new Sulphur Springs (Texas) plants. W. D. WILLES succeeds him as general manager of the Nordstrom plant at Oakland. W. T. GETTIG, former works manager of Edward Valves Inc., a Rockwell subsidiary, takes over as general manager of the Barberton (Ohio) plant.

New faces

FRANK FIEDLER JR. has joined the Thermac Co. staff as sales engineer with headquarters in Los Angeles. He was assistant manager of the AGA's Los Angeles labs.

BARTON B. DAWES has joined Timken Silent Automatic Div., Jackson, Mich., as area sales manager for its Silent Automatic Products line, working in eastern Ohio and the western parts of New York, Pennsylvania, Virginia, and West Virginia.

KENNETH YOST has joined the RCA Estate Appliance Corp., Hamilton, Ohio, as manager of manufacturing engineering. WILLIAM G. BROSENE has been named chief product engineer.

JAMES R. LOCKWOOD has joined Pioneer Water Heater Corp., Los Angeles, as vice president in charge of sales.

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TRIPLEX
BACKFILL TAMPER
Added to Gunderson-Taylor's Multiple Tamper Line.
FAST . . . SAFE . . . EFFICIENT . . . ECONOMICAL
• Offers the best method yet devised for compacting soil.
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Made by the originators of multiple tampers, the SUPER-TRIPLEX incorporates the best features of previous TRIPLEX models, plus new features which make it the outstanding tamping equipment available to contractors today.
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H. R. O'Donnell

C. L. Coleman

Sprague Meter

C. L. COLEMAN and H. R. O'DONNELL JR. have joined Sprague Meter Co., Bridgeport, Conn., as sales representatives. Mr. Coleman will cover California, Arizona, Colorado, New Mexico, and the Northwest, while Mr. O'Donnell will represent Sprague in Virginia, Pennsylvania, and New York.

Honors

ROBERT R. GROS, manager of public relations and advertising for the Pacific Gas & Electric Co., San Francisco, is the new president of the Advertising Assn. for the West.

WILLARD F. ROCKWELL JR., 39-year-old president of Rockwell Manufacturing Co., has been selected as one of Pittsburgh's "100 Outstanding Young Men" by a committee of civic leaders.

WALTER G. MCKIE, general sales manager for the Rochester (N. Y.) Gas & Electric Corp., has been elected president of the Rochester Sales Executive Club.

HARRY L. KUNZE, controller for the Milwaukee (Wis.) Gas Specialty Co., has been elected to the Controllers Institute of America.

Honored recently by the Society for the Advancement of Management was GEORGE H. PICKETT, Southern California Gas Co., Los Angeles. He became a fellow of the society.

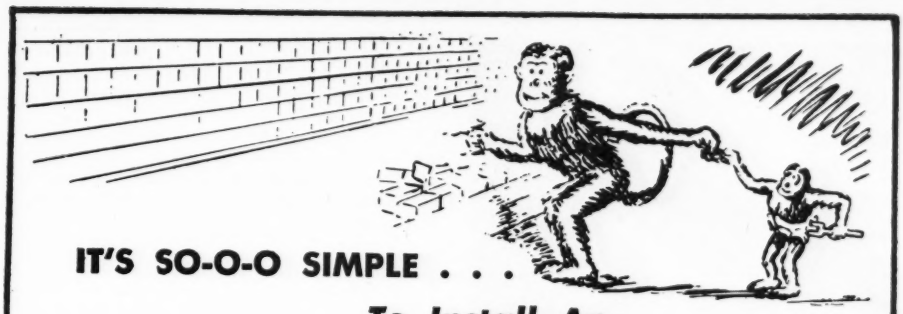
Deaths

JOSEPH H. NICKELL, manager of the Philadelphia (Pa.) Electric Co.'s insurance department, died recently after an illness of several months.

CARL BARSCHIG, an equipment executive for the Southern California Gas Co., Los Angeles, died recently.

JOHN AVERY SANBORN, since 1945 superintendent of the Ravenswood gas works of Consolidated Edison Co. of New York, died recently. He joined ConEd in 1920 as a superintendent's assistant.

ALLEN D. KERR, former district manager at Marshall in United Gas Corp.'s east Texas division, died recently in McAlester, Okla., where he had lived since his retirement in March.



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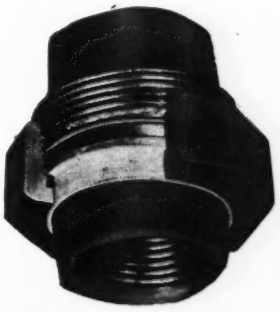

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THE COMPLETE LINE FOR ALL Gas NEEDS

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Current Reading

ALL ABOUT MODERN HOME LAUNDERING—This 80-page, illustrated book gives handy reference information on every phase of home laundering, including selection of equipment, packaged laundry accessories and other commercial products, washing, drying and ironing procedures for all new and old, natural and man-made textile fibers and their fabrics. Actually written for the housewife, the book represents recommended laundering methods and recipes, location and layout of the laundry area, and correct installation of gas, electricity, and plumbing services.

This non-commercial and non-profit book describes automatic gas water heaters and dryers, and presents a new sizing table for selection of water heaters for use with automatic clothes washers. All types of gases, their heating value and their advantages are discussed.

The book has been prepared by Ruud Manufacturing Co., Pittsburgh, Pa. Prices: 1 to 12 copies, 50 cents each; 13 or more, 35 cents each.

AMERICAN GAS ASSOCIATION PUBLICATIONS—This is a 32-page list of AGA publications now available from the association, 420 Lexington Ave., New York 17. Publications from all sections are included: general, accounting, laboratories, operating, research, sales and promotion, industrial and commercial, promotion, residential, and home service.

VENT INSTALLATION HANDBOOK—This booklet tells how to vent gas appliances, explaining the basic principles of gas venting and how these principles affect the job of installing vents that work properly. Step-by-step procedures to follow and solutions to problems usually encountered are presented.

The information in the handy 76-page booklet is based on the first thorough scientific investigation of gas venting, recently completed by Alan Kinkead, president of the William Wallace Co., with the assistance of the Stanford Research Institute. The rules and recommendations for all types of vents are the practical result of the investigation.

Copies of the booklet are available from the Metalbestos Div., William Wallace Co., Belmont, Calif.

INVESTMENT CASTING — Information Letter 57 has been prepared by Stewart C. Parker for the metals committee of the AGA industrial and commercial gas section.

Investment casting should be considered as a complement, rather than replacement of forging or the older forms of casting. This letter should be of assistance to industrial gas engineers as it gives a complete presentation of the process, the uses of gas, and the types of equipment generally employed.

For copies write the AGA, 420 Lexington Ave., New York 17.

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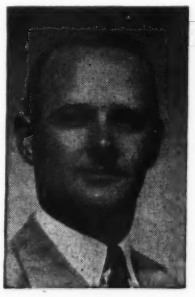
Committee appointments made for AGA convention

L. B. Bonnett, Consolidated Edison of New York, and Robert D. Lewis, Laclede Gas Co., St. Louis, are heading the distinguished service award and convention entertainment committees, respectively, for the forthcoming AGA convention, to be held Oct. 26-28 in St. Louis.

Members of the award committee include J. J. Hedrick, Natural Gas Pipeline Co., Chicago, and C. H. Zachry, Southern Union Gas Co., Dallas.

Assisting Mr. Lewis in organizing and presenting a program of general entertainment at the convention will be Paul C. Ford, Gas Service Co.; M. J. Harper, Rockwell Manufacturing; Daniel E. Maloney, East Ohio Gas; Marc W. Pender, Magic Chef; William D. Sweetman, Peoples Gas Light & Coke, Chicago; and Wilbur T. Trueblood Jr., Magic Chef. Richard F. Mulligan of the AGA will serve as secretary of the committee.

E. H. Eacker



F. M. Banks

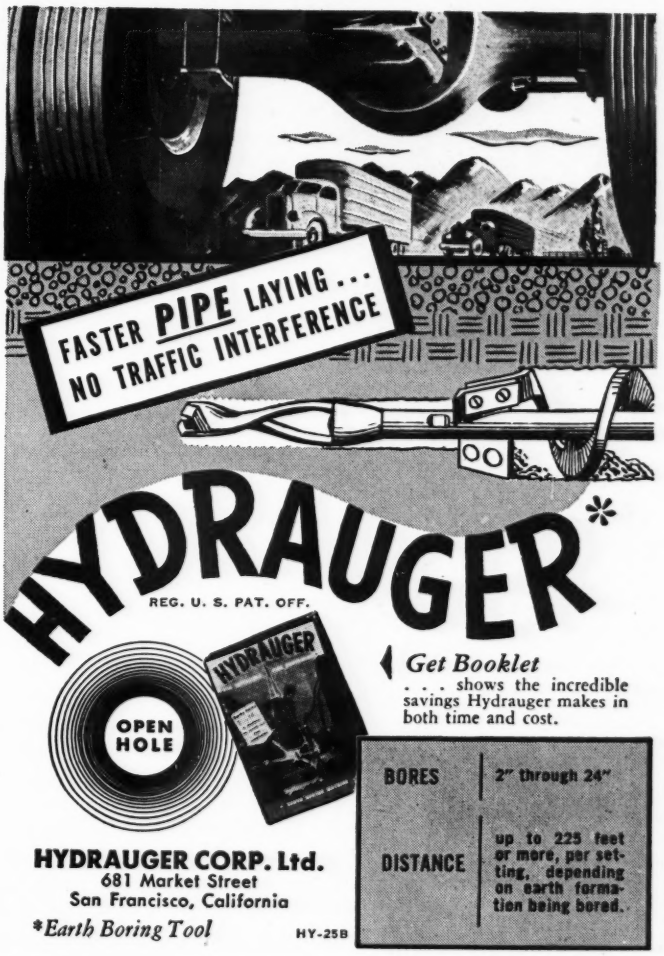
Top executives nominated to head AGA next year

Heading up the list of executive talent from member companies throughout the U. S. and Canada to be nominated as 1953-54 officers of the AGA is Earl H. Eacker, president of Boston (Mass.) Consolidated Gas Co., whose name will be on the ballot for the office of president. Election will be held at the October convention in St. Louis.

His running mates will be F. M. Banks, Southern California Gas Co., Los Angeles, 1st vice president; Dean H. Mitchell, Northern Indiana Public Service Co., Hammond, 2nd vice president; and Vincent T. Miles, Long Island Lighting Co., Mineola, treasurer.

The general nominating committee, headed by Chairman F. A. Lydecker, Public Service Electric, Newark, has also released the names of its choices for section chairmen and vice chairmen, who will serve for one year, and directors, whose terms will be of two-year duration.

Directors nominated include: M. A. Abernathy, United Gas Pipeline Co., Shreveport; B. C. Adams, Gas Service Co., Kansas City; L. L. Baxter, Arkansas Western Gas Co.,



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POSITION WANTED. College graduate B.S. degree. Two years in gas measurement and maintenance of orifice and positive meters. Presently employed but desires a change. Write Box 35, GAS, 198 S. Alvarado St., Los Angeles 57, Calif.

WANTED—CONSTRUCTION SUPERVISOR. Must have experience in constructing natural gas distribution systems and high pressure gas transmission lines. Donovan, Incorporated, 1725 Carroll Avenue, St. Paul 4, Minnesota.

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CONSULTING SERVICE

UNITED PETROLEUM GAS COMPANY
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Storage and Utilization Equipment

DESIGN — INSTALLATION
MODIFICATION — MAINTENANCE

"Every Job A Safe Job"

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LP Gas Installations
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ONE MAN OPERATION
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Fayetteville; Frank Austin Brownie, Canadian Western Natural Gas Co., Calgary; Sheldon Coleman, Coleman Co., Wichita; H. C. Cummins, Northern States Power Co., Minneapolis; J. F. Donnelly, Servel Inc., Evansville; John E. Heyke Jr., Brooklyn (N. Y.) Union Gas Co.; J. K. Horton, Pacific Public Service Co., San Francisco; D. E. Karn, Consumers Power Co., Jackson, Mich.; W. H. Ligon, Nashville (Tenn.) Gas Co.; A. W. Lundstrum, Ohio Fuel Gas Co.; Columbus; F. T. Parks, Public Service Co. of Colorado, Denver; L. B. Richards, Harrisburg (Pa.) Gas Div.; J. Theodore Wolfe, Consolidated Gas Electric Light & Power Co., Baltimore.

Nominees as section chairmen and vice chairmen:

Accounting: Paul E. Ewers, Michigan Consolidated Gas Co., Detroit, chairman; A. T. Gardner, Delaware Power & Light Co., Wilmington.

Industrial and commercial gas: Charles C. Eeles, Ohio Fuel Gas Co., Toledo, chairman; Ray Trowbridge, Seattle (Wash.) Gas Co., vice chairman.

Operating: Frederick J. Pfluke, Rochester (N. Y.) Gas & Electric Corp., chairman; W. H. Davidson, Transcontinental Gas Pipe Line Corp., Houston, vice chairman; J. H. Collins, New Orleans (La.) Public Service Inc., 2nd vice chairman.

Residential gas: Raymond Little, Equitable Gas Co., Pittsburgh, chairman; Walter H. Kurdelski, Michigan Consolidated Gas Co., Grand Rapids, vice chairman.

General management: Lovett C. Peters, Laclede Gas Co., St. Louis, chairman; Howard B. Noyes, Washington (D. C.) Gas Light Co., vice chairman.

Use every sales aid, sales executives told

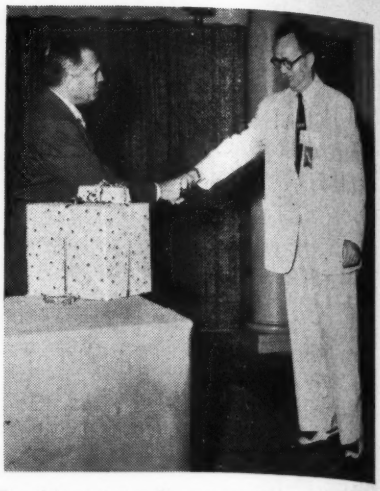
More than 200 sales executives and representatives attending the New York-New Jersey regional gas sales conference recently were urged to use every available sales and merchandising aid to increase the promotion of gas and gas appliances. Hugh L. Wathen, chairman of the New York-New Jersey regional sales council, presided at the opening session held at Spring Lake, N. J.

In his opening address, Frank C. Smith, president of AGA and Houston Natural Gas Corp., reviewed sales records of competitive appliances, showing that sales of electric ranges were increasing in the upper price range much more rapidly than were sales of quality gas ranges. Most of the gains registered by gas appliances were in the lower-price brackets.

He reviewed briefly the major objectives of the gas industry development plan, adopted by both GAMA and AGA, to upgrade appliances and to increase sales of improved appliances. A dealer sales program soon will be in operation, and an accelerated AGA laboratories testing program designed to upgrade gas appliances, is being launched.

Other talks included one of interest to small gas companies, in which Hansell Hillyer, president of South Atlantic Gas Co., told how small companies, either manufactured or natural, can build up the base load. He took exception to the belief that the small manufactured gas company was doomed. While his own company will soon convert to natural gas, he had proved that a revitalized sales force, intensive promotion, and intelligent advertising would build up the base load with manufactured gas against competitively priced fuels.

With a simple chart, B. B. Turner, The Maytag Co., showed the three phases of merchandising any product: the first phase, advertising and promotion to introduce it; in the second phase, the product gains public acceptance and the sales curve rises sharply, with the sales promotion theme stressing

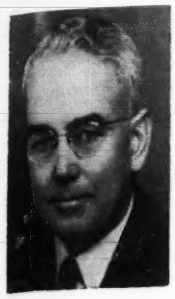


For his outstanding contributions to the residential gas section, Frank W. Williams (right), AGA secretary of the section, was the recipient of tokens of appreciation presented on the section's behalf by Chairman William J. Schmidt, Long Island Lighting Co., during the sales conference.

why it will work better than competitive products. In the third phase, the point of saturation is reached. The sales curve flattens out and the sales appeal reverts to bargain prices. The gas range industry is now in the third stage, Mr. Turner declared.

He quoted Frank Smith's figures showing that 80% of gas ranges sold were priced under $200 and that 50% of all ranges sold were priced less than $150. At the same time, competitors were capitalizing on new features and were selling the convenience and advantages of modern electric ranges at much higher prices.

Appalachian school will feature 90 class sessions



C. H. Whitwell

Close to 90 class sessions, each one hour in length, on all phases of gas metering, gas regulation, and associated subjects, have been scheduled for the 13th annual Appalachian gas measurement short course, according to C. H. Whitwell, Equitable Gas Co., general chairman of the course. The school will be held from Aug. 24-26 at West Virginia University, Morgantown.

Program Chairman C. G. Moorhead, Hope Natural Gas Co., reports that introductory classes will be held for beginners, in addition to the advance classes for others. Thirty-one companies will display their equipment in the exhibit laboratory.

Extra session added to 30th Midwest gas school

An extra half-day session has been added to the 30th Mid-West gas school and conference to permit a field demonstration of digging, backfilling, and all types of construction equipment. The school was originally scheduled for Sept. 10-11 at Iowa State College, Ames, but according to M. K. Wrench, program chairman, the school will now start on the afternoon of Sept. 9.

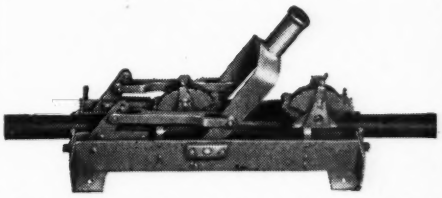
Distribution, utilization, and meter section meetings will be held in addition to the general sessions and servicemen's school. Public and utility safety will be featured prominently, as in past years.

Promotion representatives to cover country for AGA

Five promotion representatives have been appointed by the AGA as a part of a new service designed to increase the effectiveness of the advertising and promotion programs of the PAR plan. The new appointees will call on member companies in all parts of

CUT PIPE PULLING and PUSHING TIME IN HALF WITH A CONTINUOUS ACTION

TROJAN



The Trojan Pipe Puller and Pusher is ideal for any gas service installation or renewal. It lets you go under all types of pavement without breaking the surface . . . it combines pushing and pulling operations in one simplified, easy-to-operate machine . . . and what's more, with its exclusive continuous action, it requires no resetting of the grip — cuts job time in half.

The Trojan Model B (shown above) handles pipe up to 2" in diameter without additional dogs, clamps or wedges. Constructed entirely of steel for sturdy, long-life service, it requires only a 5½' trench for operation, has 3 speeds for different types of soil, can be reversed in 30 seconds. You owe it to yourself to investigate this profit maker now!

Write Today For Full Details

The TROJAN MANUFACTURING COMPANY
1119 Race Drive, TROY, OHIO

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A LIQUEFIED PETROLEUM GAS OF HIGHEST QUALITY

WARREN
PETROLEUM CORPORATION
LIQUEFIED PETROLEUM GAS DIVISION
TULSA, OKLAHOMA

SALES OFFICES:
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MIDLAND, TEXAS
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ST. LOUIS, MISSOURI
NEW YORK, NEW YORK
OMAHA, NEBRASKA

Complete CORROSION PROTECTION Service

- Highest quality

magnesium anodes

- Complete Engineering and installation service.

ANODE SPECIALISTS
AN-SPEC

AN-SPEC ANODES MANUFACTURED BY MAGNESIUM DIVISION OF M. J. CROSE MANUFACTURING CO., INC

PIPELINE Anode CORPORATION
25TH WEST AVENUE AND SAND SPRINGS RD.
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PIPELINE SUPPLY COMPANY
2230 Magnolia St. P. O. Box 7022
Birmingham, Ala. Houston, Texas

PROTECTO WRAP COMPANY
436 Douglas Blvd.
Los Angeles 12, Calif.

Positive Protection!

from Runaway Pressures! Fires!

NORWALK POSITIVE PRESSURE CUT OFF VALVES

- Gives automatic shut off when excessive pressure arises or fire occurs!
- Easily reset to desired cut off pressure!
- No pressure loss!
- All parts external to gas flow!
- Quickly reset after operation!
- Sizes from 2" to 16"

SEND FOR FULL PARTICULARS

NORWALK VALVE COMPANY
South Norwalk, Connecticut

CALENDAR

August

24-26..Appalachian Gas Measurement Short Course — West Virginia University, Morgantown, W. Va.

25-28..American Dietetic Assn. Annual Meeting—Los Angeles.

September

1-2....AGA - NEGA Conference — Boston.

9-11..Pacific Coast Gas Assn. Annual Convention—San Francisco.

9-11..Midwest Gas School and Conference — Iowa State College, Ames.

11..NEGA Industrial Division — Wachusett Country Club, West Boylston, Mass.

11..New Jersey Gas Assn. — Spring Lake, N. J.

26..SGA Transmission Section Round-Table on Rights-of-Way Problems — Tutwiler Hotel, Birmingham, Ala.

27-30..Controllers Institute of America—Hotel Statler, Boston.

28-29..Independent Natural Gas Assn. of America Annual Meeting — Shamrock Hotel, Houston.

October

6-7....Texas Mid-Continent Oil & Gas Assn. — Rice Hotel, Houston.

7-9....NACE South Central Region — Mayo Hotel, Tulsa.

15..NEGA Operating Division — Hotel Kimball, Springfield, Mass.

19-21..35th Annual Meeting, American Standards Assn.—Waldorf-Astoria, New York.

19-23..National Metal Exposition—Public Auditorium, Cleveland.

19-23..National Safety Council — Conrad Hilton, Congress, Morrison, and Sheraton hotels, Chicago.

20..NEGA Accounting Division—The Sheraton-Biltmore, Providence, R. I.

26-28..AGA Annual Convention — Kiel Auditorium, St. Louis, Mo.

November

5..NEGA Safety Conference — Hotel Statler, Boston.

9-12..API — Conrad Hilton and Palmer House, Chicago.

9-13..National Hotel Exposition — Kingsbridge Armory, New York.

11-13..Wisconsin Utilities Assn. — Hotel Schroeder, Milwaukee.

29-4..American Society of Mechanical Engineers — Statler Hotel, New York.

1954

March

4-5..AGA Transmission and Storage Conference — Jung Hotel, New Orleans.

15-17..Mid-West Gas Assn.—Fort Des Moines Hotel, Des Moines, Iowa.

25-26..New England Gas Assn. — Hotel Statler, Boston.

April

12-14..National Conference of Electric & Gas Utility Accountants—Hotel Statler, Boston.

20-23..AGA Distribution, Motor Vehicles, and Corrosion Conference—Mount Royal Hotel, Montreal, Canada.

26-28..Mid-West Regional Gas Sales Conference — Edgewater Beach Hotel, Chicago.

26-28..Southern Gas Assn. Annual Convention—Houston.

May

24-26..AGA Production and Chemical Conference — William Penn Hotel, Pittsburgh.

the country to give PAR subscribers first-hand information regarding the promotion and advertising activities originated by the AGA. In addition to urging utilities to participate in the programs, and use the materials devised by the association, the roving representatives will explain other major AGA activities.

The new men are J. Neal Hall Jr., on loan from Lone Star Gas Co., who will contact companies in the southwestern states and Kansas and Colorado; S. F. Wickstrom Jr., formerly of the Mississippi Valley Gas Co., Meridian, covering the southern states as far west as Louisiana; Stanley C. Gorman, formerly sales promotion director for GAMA's water heater division, serving companies in the Middle West as far west as the Rocky Mountains; Royce A. Hoyle, coming from South Atlantic Gas Co., Savannah, will cover the Appalachian and eastern states, including New York and Michigan; and Charles R. Bowen, recently named New Freedom Gas Kitchen manager, will serve in the New England states.

On the Pacific Coast, promotional contact work will be under the supervision of the PCGA in cooperation with AGA.

CNGA directors meet and install new officers

Fred L. Hartley, general superintendent of operations of the Union Oil Co. of California, was installed as president of the California Natural Gasoline Assn. last month at the annual meeting of the board of directors. A. C. Lyles, General Petroleum Corp., was elected vice president, and E. R. Millett Jr. was again appointed secretary-treasurer.

Among gas utility men elected to office is M. L. Fort of Pacific Lighting Gas Supply Co., chairman of the finance and budget committee. Mr. Fort was also chosen as a new director, together with Grove Lawrence of Southern California Gas Co., and R. W. Todd of Pacific Lighting.

Association notes

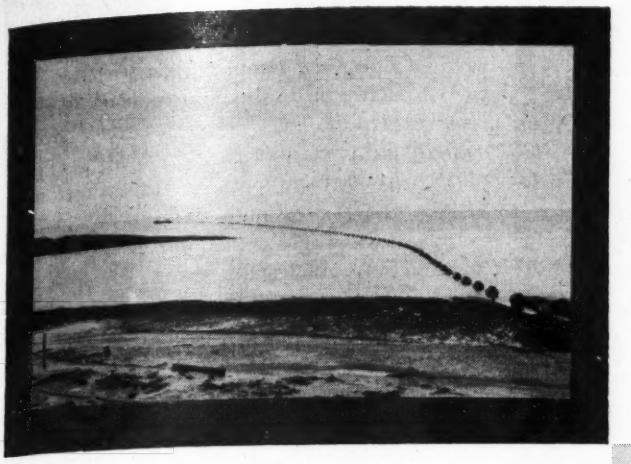
Advertising and promotion activities financed under the AGA's PAR plan have been unified and realignment and expansion of the association's promotion staff have resulted. H. Vinton Potter, who was coordinator of promotion, has become coordinator of both promotion and advertising. In addition, Clifford E. Hall has been named promotion manager and Norval D. Jennings, advertising manager.

Representatives of Canada's newest industry met in Montreal recently for the 46th annual Canadian Gas Assn. convention. The 300 delegates elected D. K. Yorath, Northwestern Utilities Ltd., Edmonton, to head them for the coming year. He succeeds outgoing president Raymond Latreille.

Elected recently to three-year terms as directors of the Public Utilities Advertising Assn. (see June *GAS*, page 54) were the following men: Ray Martin, Consolidated Edison of New York; Leander C. Roberts, Lone Star, Dallas; and Robert N. Robertson, Florida Power Corp.

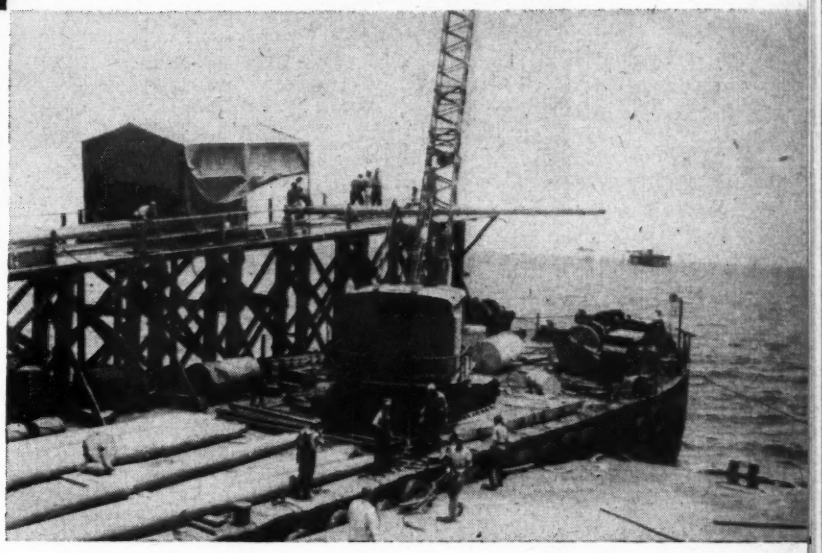
Pertinent data for the year 1952, together with statistics showing important gas industry trends during the past 20 years, are included in the 1952 edition of the American Gas Assn. annual statistical publication, "Gas Facts," which is expected to be available early this month. Again this year the use of steel and other principal materials by the gas industry is reported on, and for the first time data on the growth of underground storage facilities are included. The 1952 edition is available from the AGA, 420 Lexington Ave., New York, for $1 per copy.

Clark M. Humphreys has been appointed acting director of research for the American Society of Heating & Ventilating Engineers. Since 1945 Mr. Humphreys has served as senior engineer and recently has supervised the work on the human calorimeter and the construction of the environment and odor rooms.



The old and the new

When the new submarine line was put under construction, lessons learned since previous job were applied. At left, pipe is being launched by the pontoon method, which was used in 1950 when the first "ocean-going" pipeline was laid in the Gulf of Mexico. This method has given way to the type shown below which involves ramp-laying barges rather than pontoons. This view of the stern end of the barge shows joint of pipe being prepared for alignment and welding.



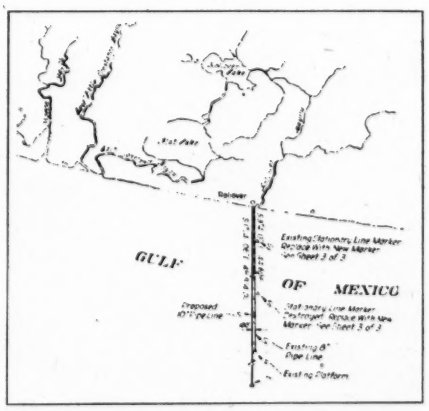
New methods for laying submarine gas pipelines

By R. C. LEDFORD
Marine Gathering Co., Houston

THE Marine Gathering Co. laid the first gas pipeline in the open Gulf of Mexico in July 1950. This line was an 8⅝-in. OD line some 8½ miles long, laid off the shores of Vermilion parish, La., to gather the gas and liquid hydrocarbons from the Pure Oil Co.'s "Rollover" field. Marine started construction on its second line in the open Gulf in June of this year. This line will be a 10¾-in. OD line approximately 9½ miles long, laid off the shores of Vermilion parish to gather the gas and liquid hydrocarbons from Kerr-McGee-Phillips Petroleum Co.'s Rollover field.

The lapse of time between the construction of these two lines has been chiefly occasioned by the controversy which has raged over ownership of the submerged lands lying on the continental shelf, often erroneously referred to as the "tidelands."* Since ownership was in doubt, necessary authorization for exploration and drilling has been difficult to secure, and represented a risky venture to the oil companies who might at any time find the leases they had developed at a tremendous expense declared null and void by the courts or some governmental agency, either federal or state.

The delay, however, had not been without its helpful aspects, since during the interval considerable engineering study and laboratory research has aided in developing new and better designs and improved construction techniques which should prove useful in the building of all future submarine pipelines. In addition, it has given the operating department more than two years of actual experience to determine weak spots in original design and construction which may be bolstered in the design of the new line, thus eliminating some of the maintenance problems, which in marine operations are always difficult and expensive.



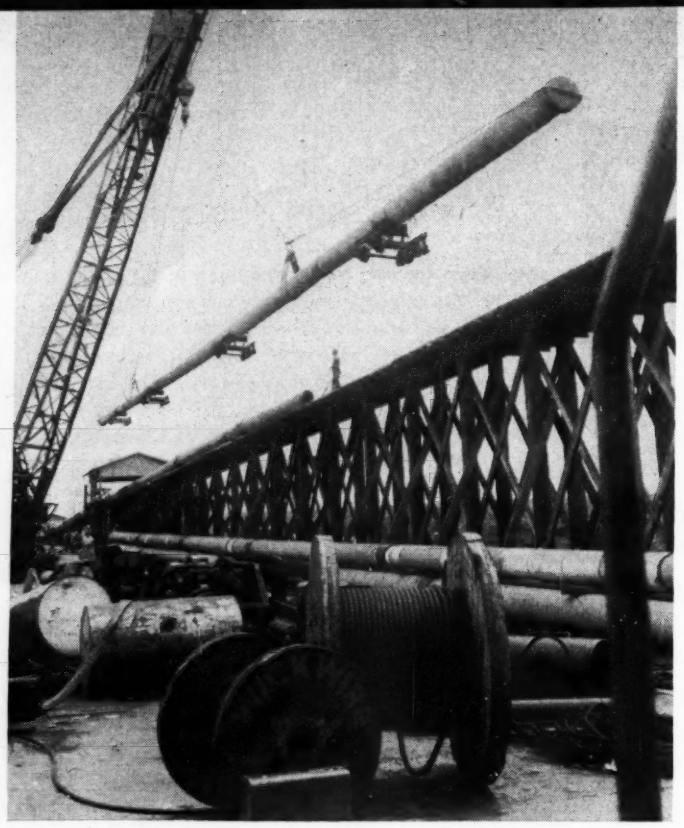
Location map shows new line in the Gulf of Mexico.

Weather considered

Weather being the most important factor, both from the standpoint of cost and time involved, all construction techniques and maintenance procedures must be patterned to take advantage of the best opportunities. Extensive construction projects must be planned and executed so that work can begin between June 1 and June 15 and completed by not later than Sept. 1. Even with this selection of the optimum weather factor, a time loss of 12% to 18% must be added to bare construction estimates.

Two principal programs of pipeline construction are being used by the con-

*President Eisenhower signed the Tidelands bill shortly after Mr. Ledford prepared this article.



of the Gulf. Welding and inspection stations are established at five positions along the ramp, so that four welds are being made simultaneously on an assembly line basis. First position aligns and tacks; second position welds stringer bead; third position makes filler weld; fourth position laces finish; fifth position radiographs welds and makes any chipping and repair welds. The pipe then moves over the stern and into the water after the welded joint has been coated and wrapped. Marine engineers do not particularly subscribe wholly to either technique; both have advantages and disadvantages. J. Ray McDermott & Co. Inc., who are the laying contractors on the new line, have had considerable marine pipeline experience and consequently have perfected their techniques to a high degree.

The pipe being used on the new project is 10¾-in. OD .365 wall seamless

Pipe being laid on ramp in preparation for welding into line. Dollies have been attached before raising pipe.

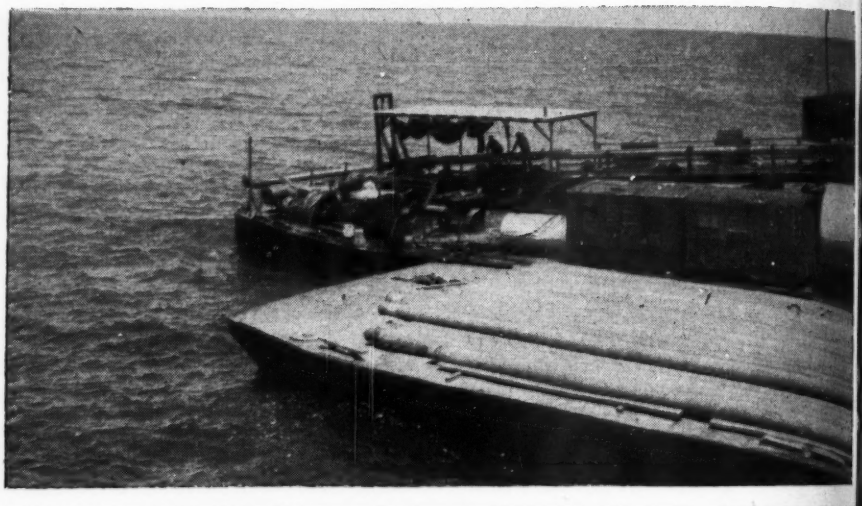
Immediately below is a view of the stern end of the ramp-laying barge showing the pipeline entering the water after X-ray had been taken of welding and coating of joints was completed. Bottom view shows the laying barge from the lower end. Welding stations will start at upper end and X-ray station will be at point where picture was taken.

tractors engaged in this activity. The first type is the method used by Marine on the construction of its first line.* Essentially, it consists of prefabricating line sections on shore which vary between 3300 to 6000 ft in length, which, after being tested, are pontooned and floated out into position on the alignment and sunk into place.

Second method

The second type is the method used by Marine on its second submarine pipeline, now under construction. This method consists of placing an anchored welding barge on the pipeline alignment with anchors set 1000 to 1200 ft fore and aft and 600 to 800 ft to starboard and port, all lines being controlled by steam winches, which allows the welding barge to pay off line behind and takeup line forward as welded sections of the line are completed and ready to be lowered to the bottom.

The welding barge is equipped with an inclined ramp, so that launching the pipe over the stern minimizes the deflection in the pipe in reaching the bottom



*"Tapping a Submarine Gas Field" by Robert C. Ledford. *GAS*, February 1951, p. 78.

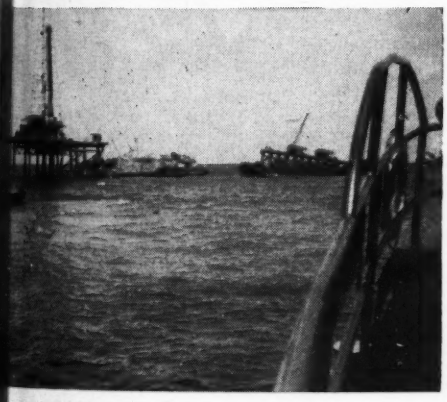
pipe, conforming to API-5LX-42 specifications. The following corrosion protection wrapping will first be placed on the pipe:

1. Machine clean (wire brushes).
2. One coat Pittsburgh Coke & Chemical Co. plasticized primer.
3. One 1/16-in. coat PC&C plasticized enamel.
4. One wrap Owens-Corning Fiberglas.
5. Second 1/16-in. coat PC&C plasticized enamel.
6. One wrap Philip Cary perforated felt.

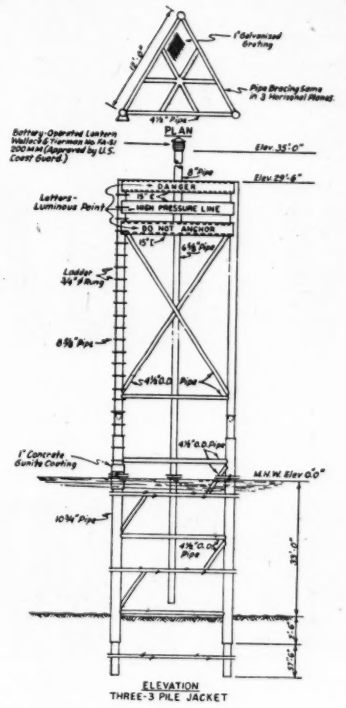
Since this pipe weighs 40.25 lb per linear foot, it is necessary that approximately 44 lb per linear foot be added in concrete coating to provide 21.45 lb per linear foot negative buoyancy or a specific gravity of 1.45. Rosson-Richards' "Wate-Kote" has been selected for this purpose. The pipe would by this design achieve equilibrium in a liquid weighing 90.47 lb per cu ft. Sampling of the mud and silt along the alignment of the pipeline from the floor of the Gulf indicates maximum densities between 84 and 88 lb per cu ft. By achieving as nearly as practical an equilibrium condition in environment, it is felt that the risk of either floating the line out of the trench or having continuing settlement after laying is minimized.

The concrete coating will also serve a dual purpose of protecting pipe during handling and from marine organism attachment after laying. Marine's first line had this extra weight in heavy walled pipe but economics dictated less expensive weight on larger lines.

The corrosion-protection wrapping differs from Marine's original specification only in the outside wrapping, where perforated felt was substituted for glass outer wrap. Experience indicates that the concrete Wate-Kote gets a better bond on felt than on glass fibers.



Ten miles out to sea is this ramp-laying barge adjacent to Phillips platform. Kerr-McGee Co. drilling barge is in background.



New type marker installed by Marine Gathering.

The most critical section of a marine pipeline is that point at which it emerges from the water to rise to the operating platform in the Gulf. Cathodic protection has proved to be excellent below low water where the water furnishes the continuity to complete the flow of electrical energy from magnesium anodes to the pipeline, thus tending to lay down a calcareous deposit on any break in the wrapping so such breaks become self-healing. By the same token, from a point 5 ft above high water, conventional protective coatings are effective and have fairly long life. But in the zone between low water and 5 ft above high water barnacle encrustation, wave action, sunlight, and salt spray make it difficult to maintain protection on the line.

The most expensive types of coatings, wrappings, and plastics have been used in this critical area and all have resulted ultimately in failure. It is proposed on the new line to protect this portion by concrete coating over the coal tar enamel and glass wrap. This type of protection should be impervious to washing, marine organism, and, of course, sunlight and salt spray.

At the platform end of the pipeline, where connections are made to the low temperature dehydration equipment installed at that point, the vertical riser from the floor of the Gulf to the deck will incorporate three Chiksan marine swing joints which were especially designed for submerged salt water service. This is a similar installation to that used on Marine's first line at the Pure Oil Co.'s platform. Three years of service have indicated that these joints are eminently satisfactory for providing flexibility in the line at this critical point. It will also make possible provision for any misalignment which might later occur as a result of settling in the mud. Flexibility in this platform connection is essential, due to wave action on the line and the platform causing unequal movement and resultant stresses due to such movement. These joints have met all requirements in regard to this problem.

The line markers which will be used on the new line have been designed with considerably more stability than those used on the original line. Marine's experience in the loss of one of its existing markers in a severe Gulf storm dictated a change of design. In the new marker (see drawing) the tripod structures have been substituted for single pile type. The markers serve the dual purpose of warning marine traffic of the presence of the line and also as anode stations and check points for the cathodic protection system.

Terminal box

Markers are so constructed that electrical cables which tie the anode beds to the line itself come up onto the platform of the marker where a terminal box is located, so that the current drain may be checked at frequent intervals. The alternate marker would have no anode bed, but only a check cable so that the potential to ground on the line can be checked. Both markers will have anode beds for the protection of their own structural members from electrolytic corrosion.

It may be noted that the lower ladder rings on the markers which are exposed to splash and spray are fabricated of monel tubing. The marker structural members are concrete coated above and below mean Gulf level to minimize anti-corrosion maintenance. The upper portions of the markers will be painted with conventional marine paints which require maintenance about every two years.

It is anticipated that approximately 60 days will be required to construct the new line and the facilities should be ready for operation by Sept. 1, 1953.

WE'RE SO PROUD TODAY...WE'VE GOT

A NEW BANTAM

IT'S A CRAWLER

and it sells for only

$9,350

F.O.B. FACTORY—BASIC CRAWLER WITH 1400 LB. COUNTERWEIGHT, LESS ATTACHMENT
Price Subject to Change

Your Schield Bantam Distributor is Scheduling On-The-Job Demonstrations Right Now...

See Him Today!

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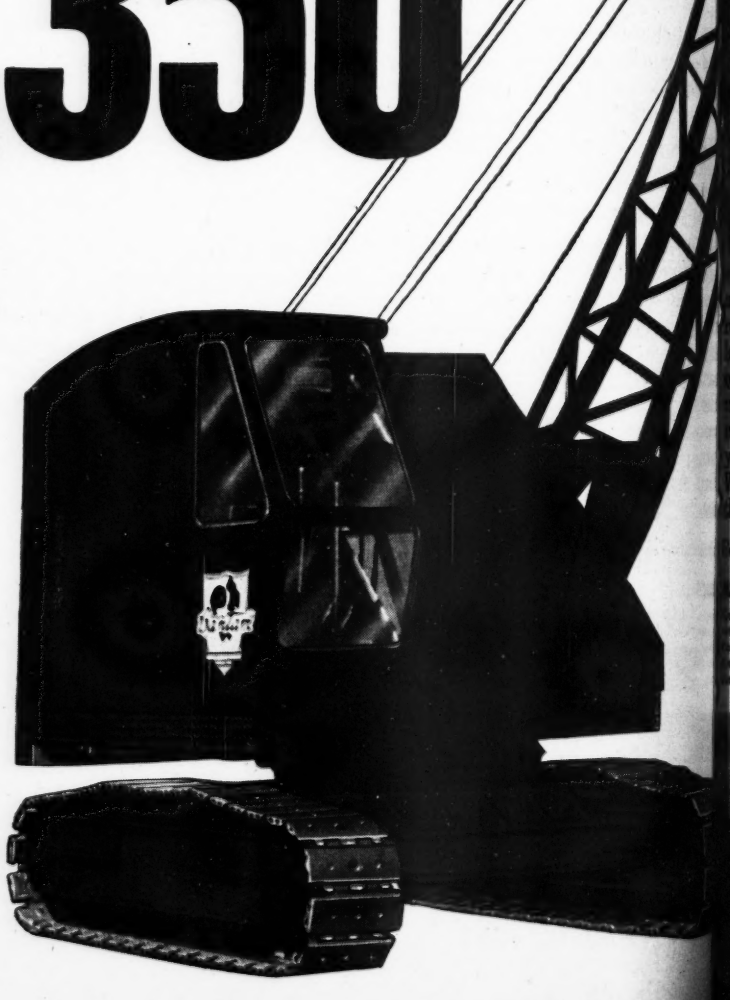

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WORLD'S LARGEST PRODUCER OF TRUCK-CRANES AND EXCAVATORS

...JUST LOOK WHAT YOU GET!

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5 TON — ⅜ CU. YD.

Available with 9 fast-change attachments:

BACK HOE	CLAMSHELL	MAGNET CRANE
CRANE	SHOVEL	PILE DRIVER
DRAGLINE	GRAPPLE	BACKFILLER

2-SPEED INDEPENDENT TRAVEL—enables the operator to move at varying speeds, forward or reverse, while operating the front end attachment.

LOW GROUND BEARING PRESSURE—2 pad sizes available. 5 lbs. per sq. in. with 16" pads—3⅓ lbs. per sq. in. with 24" pads.

BIG MACHINE STABILITY—longer, wider tracks—and a low center of gravity gives greater lifting capacity.

HIGH SPEED OPERATION—features immediate acting straight mechanical controls, easy positive braking action, fast line and swing speeds.

FAMOUS BANTAM FEATURES—power boom hoist, machine cut gears, anti-friction bearings, 4 hook rollers, greater visibility.

94-INCH OVER-ALL WIDTH—allows the Bantam to be moved from job to job on standard trailers without special highway permits.

OVER 4,500 Satisfied Bantam customers all over the world tell the story better than we can! Building one size machine and making it a top quality rig has been Schield Bantam's contribution to Shovel-Crane Industry. Bantam's specialization and mass production of this ⅜ cu. yd. machine has meant higher quality at the lowest cost in the industry! The idea of the all-purpose ⅜ cu. yd. power shovel-crane has long since found wide acceptance. NOW . . . you, too, can receive the rewards from this great American idea by letting Schield Bantam solve your lifting and excavating problems! **Whether your work calls for a crawler or a truck mounted crane-excavator, the BANTAM can do your job faster . . . better . . . cheaper! Write *today* for further information on the BANTAM for *your* jobs!**

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Crawler working in solid mud . . . crawls out after trenching with no trouble. High elevation enables Bantam to work in any kind of underfoot conditions—muck, mud, sand, etc.

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DRAGLINE

Digs 90 cu. yds. per hour in average material, available with perforated or solid buckets. Ideal for gravel pits, ditch cleanout, cutting new drainage ditches, basement excavations, stock-piling, pits, etc.

CLAMSHELL

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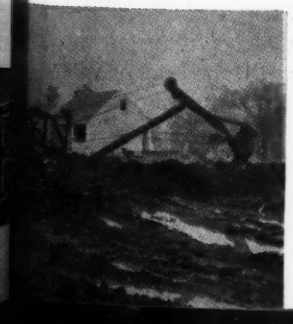
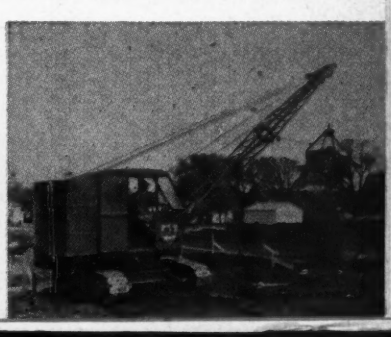
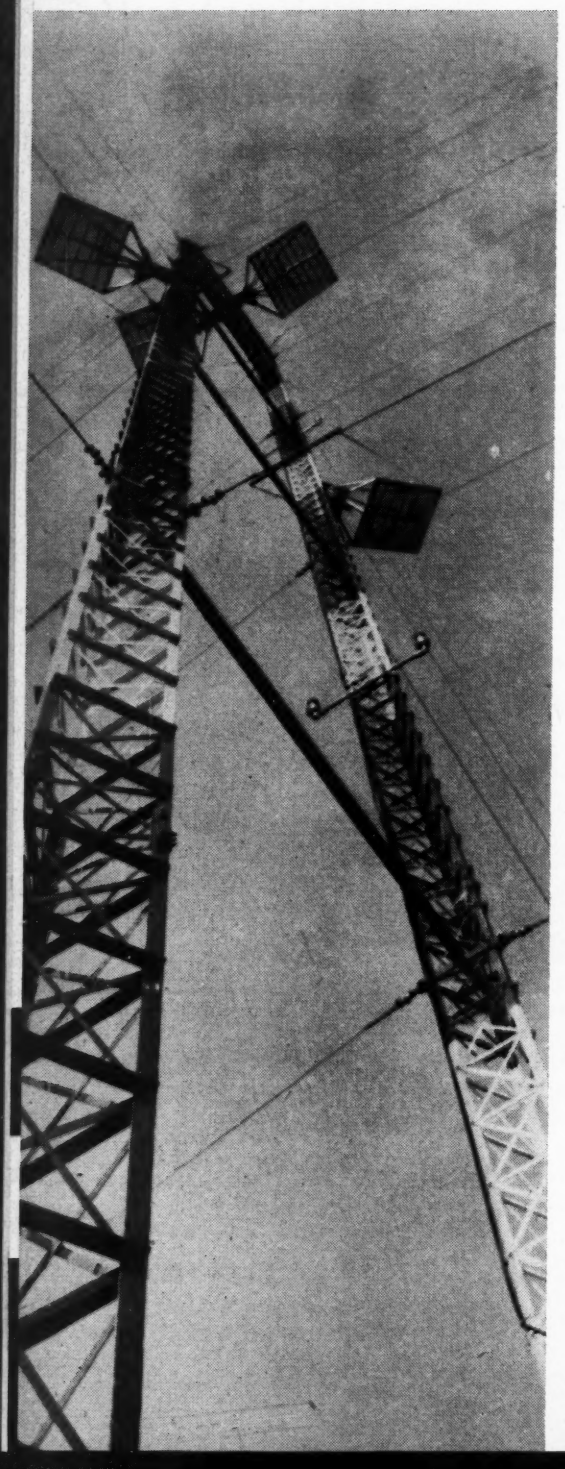




Microwaves direct Panhandle's pipeline pumping operations

By **DARRELL KNIGHT** • Motorola Inc., Chicago



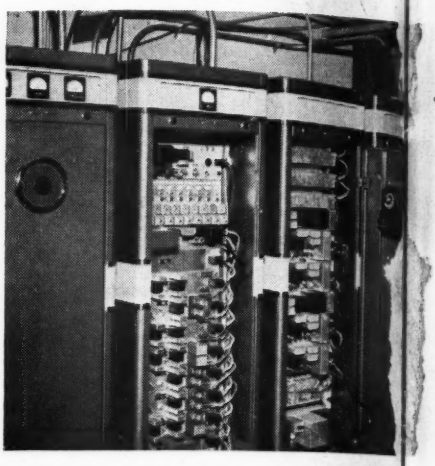
Four reflectors are installed at the top of the tower at the Liberty School, Ill. relay station. Two reflectors are aimed at relay stations along the pipeline; two toward Pittsfield and Pleasant Hill.

IN January 1952, the Panhandle Eastern Pipeline Co. officially began operation of its 400-mile long multichannel microwave system. The system, which parallels the company's pipeline path, extends from Kansas City, Mo., to Tuscola, Ill. Over the point-to-point microwave system go all messages, both voice and telemeter messages, which direct the pumping operations at all compressor stations along the way. Voice channels include private executive circuits as well as party line and pipeline maintenance circuits.

Prior to 1945, all operational messages east of Kansas City were handled by long distance toll telephone calls or by telegraph. The tremendous traffic required to operate the pipeline proved that these communications facilities were both inadequate and costly. Aside from routine calls, emergencies demanding fast communications were often delayed by the lack of a private system.

VHF system installed

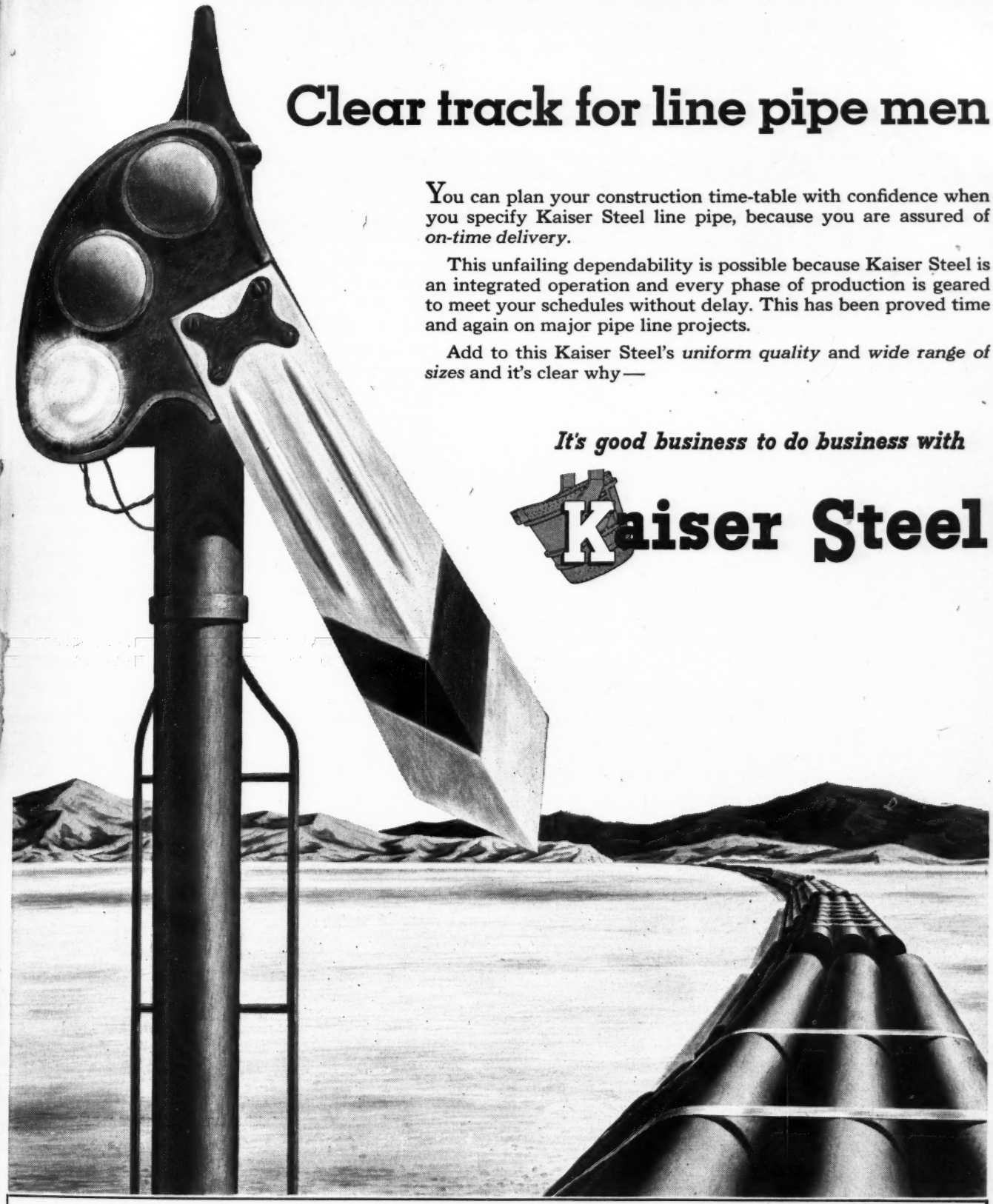
Later in 1945, the company took steps to alleviate the communications problem by installing a company-owned Motorola VHF two-way radio system. FM 250-watt base stations were installed at each of the compressor stations with 50-watt base stations at each of the pipeline's district offices. Tied in with these base stations were approximately 60 mobile transmitter-receiver units installed in supervisory and maintenance vehicles.



Subcarrier multiplex and termination equipment cabinets in Kansas City. Jim Fowler, superintendent of communications, talks directly with compressor station personnel miles away.

This extensive VHF system served to complement the existing telephone and telegraph communications and was used by the company until 1950 when the decision was made to increase point-to-point channel capacity. The reason for expansion was mainly due to an additional gas load being transferred to Panhandle Eastern's lines from the Trunkline Gas Co. at the Tuscola compressor station. At this point, Trunkline supplied Panhandle Eastern with 250 MMcf of gas per day.

Microwaves were selected over other types of communication systems for several reasons. First, a microwave system offered maximum channel capacity at minimum cost. On the basis of present-day figures, first costs per circuit mile for microwave is about $100 per mile as compared to a wire land line circuit mile



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Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
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Electric Resistance and Fusion Weld—Plain End	14" to 18" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5 5/16" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser

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cost of approximately $190 per channel mile.* With microwave, costly land easements and long distance land line construction are eliminated.

Aside from offering the company a completely private system, microwave had the added advantage of long-term, low-cost maintenance which reflected in dependability of communications — a factor of top importance in pipeline operations. The microwave equipment is, for all practical purposes, immune from outages due to high winds, storms, icing, and other disturbances that plague systems using long wire construction.

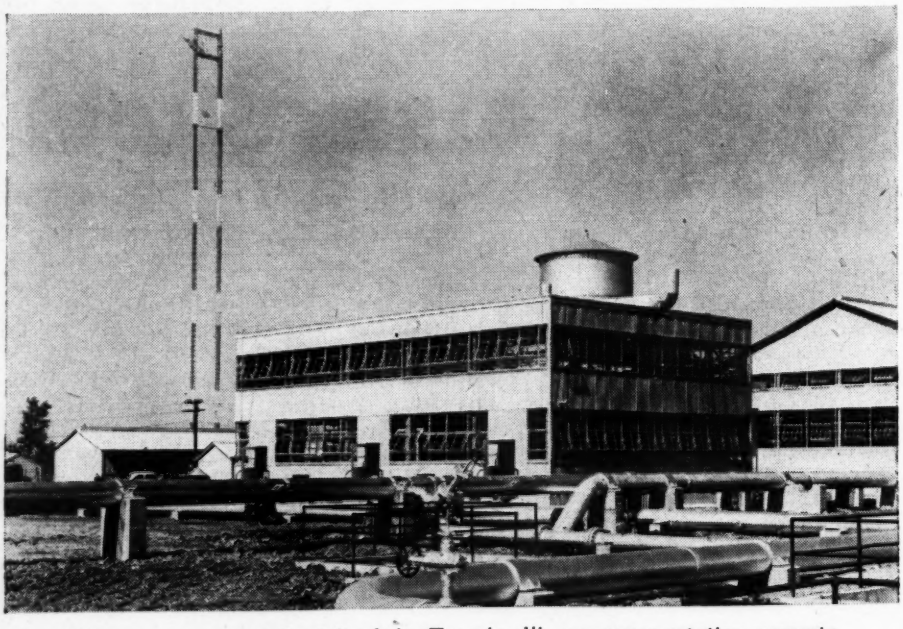
While microwaves were comparatively new at the time Panhandle Eastern considered expansion of their point-to-point facilities, their experience with radio communications previously had pointed out radio's strong advantages of dependability, low maintenance costs, versatility, and flexibility.

Point-to-point systems

Microwaves are ideally suited to point-to-point communications because of their straight line, light-like propagation characteristics. It is in this respect mainly that microwaves differ from the long used VHF radio systems operating in the 25-50 mc and 152-174 mc frequency bands.

Several messages at once

Microwave systems are capable of transmitting several messages simultaneously. This is done by a process known as multiplexing in which several subcarrier frequencies or channels are superimposed on the microwave carrier frequency. Through the simple use of filters, the various subcarrier frequencies superimposed on the microwave carrier are separated at the receiving station and fed to individual termination equipment.



Microwave tower at the left of the Tuscola, Ill. compressor station supports reflector which directs received beam to paraboloid antenna below. This is the eastern terminal of the microwave system.

This subcarrier arrangement makes the system completely flexible. By the simple addition of filters, channels can be dropped out, monitored, or inserted at any or all of the repeater stations.

Along the Panhandle Eastern pipeline, 18 microwave stations manufactured by Motorola Inc. are installed at various intervals with an average distance of 23 miles between stations. The longest span is 36 miles. Of the 18 stations, two are terminal stations, seven are attended stations and nine are unattended stations. The attended repeater stations are located at Houstonia, Boonville, Centralia, and Mexico in Missouri and Pittsfield, Pleasant Hill, and Glenarm in Illinois. Unattended repeater stations are situated at Little Blue, Odessa, Ridge Prairie, Woodlandville, and Spencerburg in Missouri and Woodson, Blue Mound, Casner, and Liberty School in Illinois.

The microwave stations in the Panhandle Eastern system are of two types. The majority of the stations are of the "Micropackage" type in which all electronic equipment is installed in a small concrete block shelter. The equipment is mounted in vertical racks which double as roof supports. On the roof, directly above the equipment, are mounted 40-in. diameter paraboloid antennas. The antennas are aimed at nearly flat perforated aluminum reflectors mounted at the top of a tower and positioned at an angle of 45° with a horizontal plane. These reflectors, which vary in size depending upon tower height, reflect the radiated energy horizontally to the next station.

The second type of station is a "remote" type used where an existing shelter is available. In this installation, the microwave RF equipment is mounted in an outdoor weatherproof housing. All subcarrier and control equipment is housed inside the existing shelter.

Four directions

A unique "double spur" arrangement is employed at the Liberty School, Ill., site. At this point the microwave signals are beamed in four directions—to Pittsfield on the north, Pleasant Hill on the south, Spencerburg on the west, and Woodson on the east.

Seven subcarrier channels are used in the Panhandle Eastern system with three additional channels reserved for future expansion. Five of these channels are used for voice communications and two for telemetering.

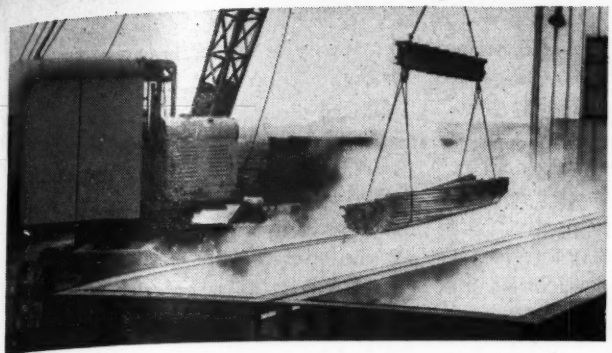
Following is a brief description of each of the channels in the system:

Channel 1 is used as a private line from the main office at Kansas City to the far end of the system at Tuscola. The Kansas City end of the circuit terminates in a manual switchboard which permits direct connection to phones in the executive office. At Tuscola, the circuit terminates in a magneto ring phone. The circuit affords full duplex operation (simultaneous two-way conversations).

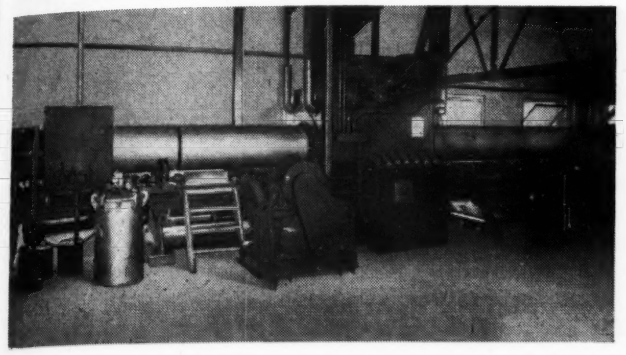
Channel 2 is a party line circuit serving Kansas City and compressor stations at Houstonia, Centralia, Pleasant Hill, Glenarm, and Tuscola.

A unique lock-out feature permits only one station to transmit at any one time; however, all other stations may monitor simultaneously. The other sta-

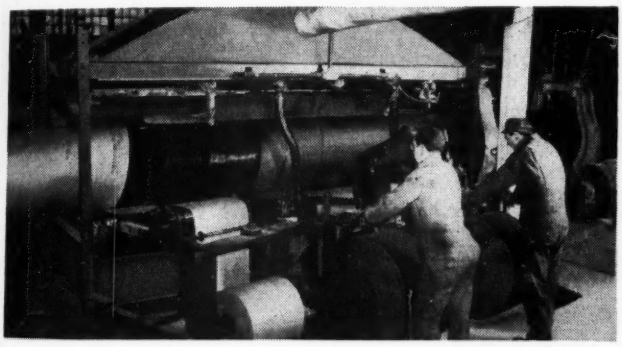
*These cost figures are based on a study recently reported by Victor J. Nexon, vice president and senior consultant of Microwave Service Inc. in the March 1953 issue of *Radio & Television News*. The study was based on a comparison of equivalent 100-mile open-wire and microwave systems having a 24-telephone circuit capacity.



HOT CAUSTIC DIP removes all cutting oil and grease. Pipe is then rinsed in clear, hot water and dried in warming room. Throughout Hill, Hubbell process, pipe is kept at 80-90° to prevent moisture condensation.



ROTO GRIT BLAST removes all mill scale and rust, cleans pipe to bare, bright metal, provides a slight "tooth" to hold coatings in positive bond. Priming coat is applied immediately after Roto Grit Blast.



SECRET of Hill, Hubbell superiority is applying enamel in multiple 1/32" coats instead of one thick coat—pipe protection insurance that pays off in the field. Then pipe is tightly wrapped under even tension by special machines.

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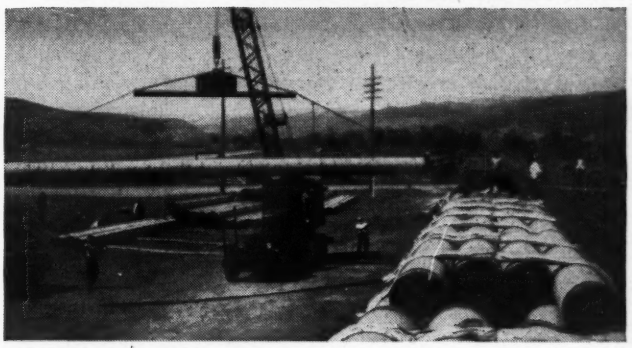

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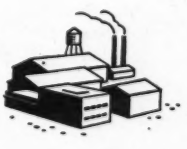

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tions may break in to the conversation during a lull in transmission. A dial system selects the desired station.

Channels 3 and 4 are party lines similar to the compressor party line. Channel 3 is used by all attended stations, whereas channel 4 ties in only at Kansas City, Boonville, Mexico, Pittsfield, and Glenarm.

No delays

The private line and three party lines with selective signaling facilities are more than adequate to handle station-to-station and system traffic at the present time. The most important advantage in this company-owned system is that there are no delays. When a circuit is needed, it is available.

Provisions have also been made to tie the company's extensive VHF system into the microwave point-to-point system. From the 60 mobile units in 1945, the present system has grown to include over 200 mobile units in maintenance and supervisory vehicles. Mobile-to-mobile, mobile-to-station, and station-to-station communications are provided. With this arrangement, a supervisor in a radio-equipped vehicle far away in Illinois can talk directly to the executive office at Kansas City.

Continuous pressure conditions along the 400-mile system are transmitted over two telemeter channels to the dispatching office at Kansas City. Twelve telemeter transmitters are located at Tuscola, Glenarm, Pleasant Hill, Centralia, and Houstonia. From these telemeter transmitters, the two channels carry the information to Kansas City where the quantities of suction and discharge pressure in the cross-country pipelines are recorded on strip chart recorders in the pressure room on the 11th floor of the Midland Bldg.

Before the installation of the microwave system, all pressure readings were phoned to the Kansas City office every two hours.

99.8% reliability

According to data gathered by Panhandle Eastern during the first year of operation, system reliability was 99.8%! This almost perfect record of uninterrupted service reflects even more favorably on the reliability of the electronic equipment than the figure indicates since many outages can be attributed to a.c. power failures, either in the primary power source or in standby a.c. generating equipment.

C. B. Lester, chief engineer of the Midvalley Pipe Line Co., whose microwave system is similar to that of Panhandle Eastern's, reported a system continuity of "something over 95%." And, according to Mr. Lester, 95% over the 5% outage time can be traced to causes not even remotely connected with the microwave equipment. By far the greatest majority of Midvalley's outages were attributed to power failures.

One of the major factors contributing to the high reliability on the Panhandle Eastern system is that standby equipment is installed at each station. Automatic sensing circuits constantly monitor the operation of all RF equipment. Any failures or irregularities in operation of the RF equipment cause automatic switchover to the standby unit which is almost an exact duplicate of the main unit, even including duplicate power supplies.

The use of the standby unit also prevents discontinuities in service during routine tune-up and preventive maintenance tests. For this, the equipment is manually switched to the standby unit and any work can then be performed on the main unit without any system interruption.

Auxiliary equipment

Auxiliary standby motor-generator sets are installed at remote stations and automatically supply a.c. power when the primary power source fails.

Maintenance of the 18-station microwave system is handled by four radio technicians with headquarters at Kansas City, Mexico, Pittsfield, and Tuscola. Each technician is responsible for the equipment along a 100-mile section of the system. These same technicians also maintain the VHF system including the base stations and the 200 mobile units.

Maintenance costs, including the cost of leasing the land where the unattended stations are located, total only $1200 per year, according to the company.

Maintenance has been greatly simplified by the use of automatic alarms to indicate switchover from the main unit to the standby unit, primary power failures which cause switchover to the standby a.c. motor generator set and tower light failures.

Notification of the failures is automatically transmitted to the attended stations where indications are made on master alarm detectors.

According to J. A. Fowler, superintendent of communications, future plans include a tie-in at Tuscola with Trunkline's 1000-mile system.

With the new communications tool, Panhandle Eastern can now better coordinate all phases of its complex and far-flung operation. And, as its system expands, additional channels can easily and inexpensively be added to accommodate the increased traffic.

VHF system tied into microwave circuits extends range of VHF coverage.

You'll cinch low-cost trouble-free performance with

DARLING PIPE LINE GATE VALVES

THE unique operating principle of Darling Revolving Double Disc Gate Valves offers you a number of cost-reducing advantages. Here are only four of the major ones . . . .

1. Positive easy closing

2. Automatic adjustment for valve body distortion

3. Elimination of gate-to-seat galling

4. Unsurpassed maintenance economy

HERE'S WHY. As shown, there are only four simple working parts in the gate assembly—two wedges, two discs free to *revolve!* Discs seat in a different position at every closing. Wear is evenly distributed, prolonging disc and seat life, minimizing maintenance and contributing to positive, tight closing.

Next, note how face of upper wedge is radiused. Faces are also transverse beveled. This equalizes wedging pressure and *automatically* adjusts for valve body distortion, avoiding leaks, down-time and costly repair.

Finally, see how wedging pressure is exerted *only* when discs are *all the way down,* directly opposite seats. Wedging pressure is released *before* discs are raised. Obviously this eliminates severe friction and galling, makes valve operation *easy,* and prolongs trouble-free life of discs and seats.

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Darling 20" cast steel pipe line valve, with bevel gear and grease case, for cold pressures up to 1000 pounds. This Fully Revolving Double Disc Parallel Seat Gate Valve is one of Darling's many gate valve types and sizes available for any normal or unusual service.

The Valve Mark of Quality
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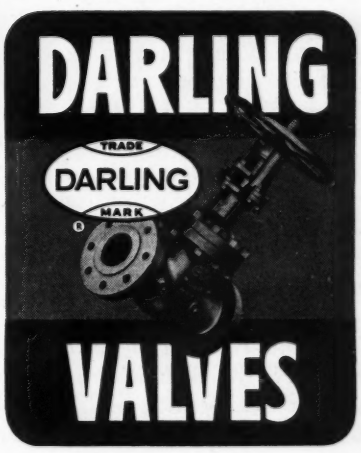

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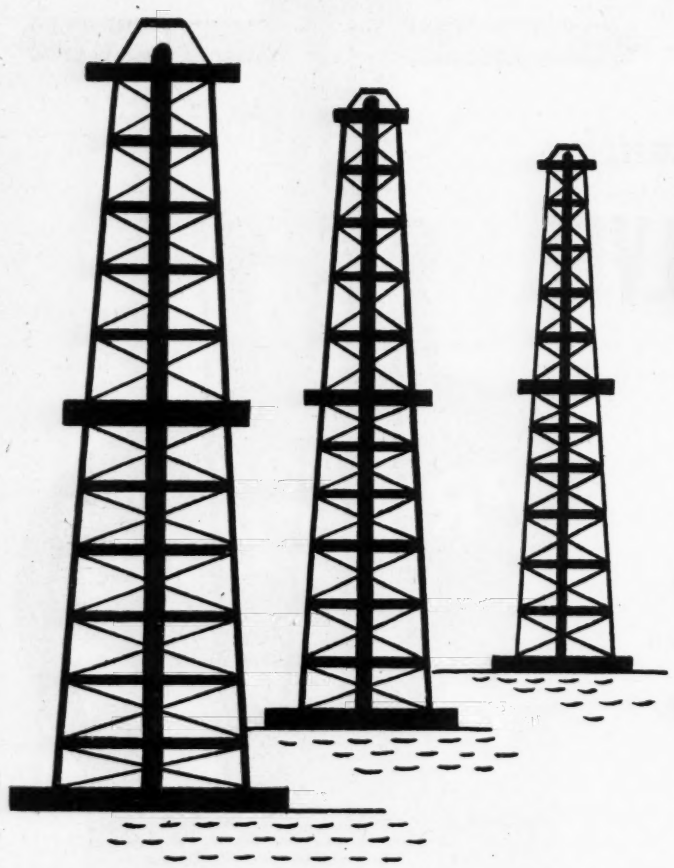

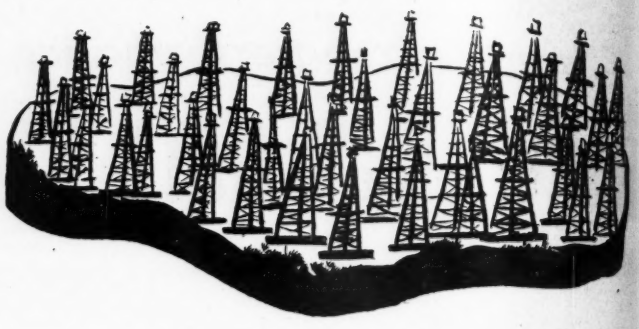

They made three wells do the work of 40

By MERLE CUNNINGHAM

GAS exclusive

TWO of Southern Union Gas Co.'s underground gas storage projects in New Mexico are located near the point of consumption, but the third and major project is unusual in that it is located at the source of production.

The Barker Dome storage project is situated about 20 miles northwest of Farmington, in the San Juan Basin in northwestern New Mexico, more than 200 miles from the cities it supplies, but the project has proved to be an economic operation, in addition to accomplishing its two-fold purpose of providing an off-season summer load for the company's purification plant and storing gas for winter's peak demands.

To provide the same amount of natural gas that can be delivered from this project, Southern Union would have to drill 40 additional wells at a cost of more than $3 million. Since 1947, when the reservoir was converted to storage, the company has drilled only three additional wells in the field, and they were drilled strictly for storage, at a cost of $100,000. The stored gas is being taken from a deep zone, treated, and stored in a shallow zone on the same lease.

Southern Union serves Albuquerque, Santa Fe, the Atomic Energy Commission at Los Alamos, and a number of other towns in northwestern New Mexico, where temperatures drop sharply during the winter, causing a rapid increase in the demands for gas.

Beginning in 1942, the company drilled a number of deep wells in the Paradox formation of the Barker Dome field. The gas from these wells contained carbon dioxide and hydrogen sulfide, necessitating the company's construction in 1946 of a purification plant. To utilize all of the plant's capacity in the summer while market demands were low, the company decided to store some of the treated gas, for winter peaks, in the field's upper formation, the Dakota zone.

That formation, at a depth of 2500 ft, covers some 5000 acres and has a gross maximum thickness of about 250 ft and a net thickness of 100 ft. The upper 60 ft is hard and tight, having a porosity of about 11% and a permeability of some 2 and 3 milliD'Arcy. The lower section is more porous, with a porosity of about 19%, and has a higher permeability, ranging from 50 to 150 md., and, therefore, a higher deliverability capacity. It is gastight, the first requirement for an underground storage reservoir.

Only one Barker Dome well was cored and just a few feet of sand analyzed; so the reserves have been calculated using the pressure-decline method. Neither an accurate estimate of the reserves nor purchase of any of the gas in place was necessary when the reservoir was converted to storage, because the company controlled the entire field.

The structure of the reservoir is a dominal trap. Original rock pressure of the field was 693 lb. That pressure declined to 492 lb with a cumulative production of 6897 MMcf of gas during the years 1942 to 1947. On the basis of pressure drop and cumulative production, the original reserves were estimated at 23,777 MMcf, leaving a cushion of 16,888 MMcf. However, since an active water drive was found to be present, which would affect the reserve calculation determined by pressure decline methods, the cushion has been set at 13 billion cu ft, rather than 16,880 MMcf as indicated by pressure decline.

Cumulative injection since storage began is 7445 MMcf, while 3199 MMcf has been withdrawn. An estimated 3.8 billion cu ft of storage space remains.

The company plans to keep the stabilized reservoir pressure within 650 lb in order not to exceed the original rock pressure, which would risk leakage. No leakage is indicated, and it is thought a casing leak would be the only leakage

When everything's right . . . you roll!

These "boom cats" are lowering a completed pipeline into its permanent location after which backfilling the trench is begun . . . the final steps on a job that rolled along smoothly, because everything was right . . . from the start.

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Completely packaged compressor plants installed in remote New Mexico station

(See pipeline cover.)

The first two of the largest packaged compressor plants ever built were installed recently in Largo Canyon, N. M.

The twin plants, each 550 hp, were manufactured by the J. B. Beaird Co. Inc., of Shreveport, La., for installation by the El Paso Natural Gas Co. The huge plants are equipped with the new Ingersoll-Rand 10-SVG gas engine-driven compressor and are assembled on a heavy steel base complete with every component, connection and control which is ordinarily found in a permanent compressor station. Automatic controls permit the unit to operate for extended periods without attention.

The compressor station is located 45 miles from the nearest town in San Juan Basin, New Mexico, and approximately 100 miles from the nearest railroad station. Although each unit is 550 hp, their comparatively light weight of 75,000 lb each made it possible to haul them by truck over gas field roads and delivered as completely assembled units ready for use.

On stream immediately

Because of the complete packaging, El Paso was able to put the plants on stream immediately, boosting field gas into gathering lines for a gasoline plant. Provision was made for addition of a third unit which will require no additional installation except for tying in of suction and discharge lines. The third unit, which will boost the station's horsepower to 1650, has been ordered for delivery this fall.

Severe winter weather in Largo Canyon with the threat of complete isolation of the station by a snowstorm made it necessary to include special equipment in the plant for protection against climatic conditions.

While the units are normally checked and lubricated once during each 24-hr period, a bad storm might cut off the station for as much as three days. With that possibility in mind, Beaird engineers arranged the compressor cylinder lubrication system so that the forced feed lubricator has a constant supply of oil.

High altitude and low winter temperatures also presented the need for preventing fuel gas freeze-ups. Beaird engineers solved that problem by placing a heat exchanger on the water line which uses jacket water to warm the fuel gas.

Because of the remoteness of the location, factory packaging of the 10-SVG units was the most practical means of getting as much as 1650 hp on stream without costly delays and excessive expenditures. The completeness of the packaged station made unnecessary the expense of requisitioning, warehousing and transporting to the field the hundreds of parts required in a fully equipped plant. Also avoided were additional heavy labor costs that would have been required to field-assemble the plant. Had it been necessary to assemble the Largo Canyon station in the field, much time would have been lost in fabricating individual components. On the other hand, manufacturing the complete units in the factory with precision-built parts assured maximum efficiency of operation and minimum loss of time in the field.

While the New Mexico station marked the first installation of a packaged 10-SVG unit, other installations of two to five units will soon be made in Pennsylvania, Colorado and Louisiana. Other Beaird standard models range in size from 110 hp to 440 hp.

The 10-SVG units are 11 ft wide, 25 ft long, and 11 ft high. Ingersoll-Rand 440 rpm, four-cycle, V-type engines power the 10-SVG units. Suction pressure on the 10-SVG units ranges from 200 to 300 psi and discharge pressure from 500 to 600 psi. Each unit pumps approximately 10 MMcf of gas per day. Automatic unloaders help maintain a constant load on engines in spite of varying suction and discharge pressures.

Completely equipped

Included in the Beaird packaged compressor plant are a suction scrubber to remove liquids; intake manifolds, discharge manifolds and all interconnecting piping; a Young radiator with cooling coils for jacket water, lubricating oil and gas; thermostatically operated temperature control with directly connected three-way valve to maintain jacket water at correct temperature; jacket water surge tank to provide ample capacity for expansion of the coolant and maintain a positive head on the water circulating pump suction; a starting air system to start the compressor engine with compressed air; a complete lubricating oil system consisting of pump, filters, cooler and interconnecting pipe; a fuel gas system with regulator and surge tank; gauge panel with gauges for intake and discharge pressures; flywheel and fan drive belt guard to afford safety for the operator without blocking the flow of air to the fan; a large, heavy duty oil bath air filter complete with backfire relief valve, and an efficient engine exhaust silencer.

The rugged steel base for the 10-SVG packaged plant is designed not only for static load, but also for dynamic load. Construction of the steel base at the factory permits proper leveling of the compressor in manufacture and assures its arrival on the location in the same condition.

possible. The company has an agreement with operators in that area to case through the Dakota zone.

One of the 14 storage wells is nonproductive due to water; so 13 are being used, and daily injection into them is at the rate of 8.5 MMcf. The Barker Dome project is capable of delivering 20 MMcf a day at the present time; however, 13 MMcf has been the peak withdrawal.

The gas produced from the storage reservoir is not compressed until it has traveled some 35 miles to a compressor station, which is used to compress other low pressure gas produced in the San Juan Basin.

Southern Union's other underground storage projects also are in a semi-depleted field, the Red Lake field in Eddy county, southeastern New Mexico. These projects, Vandagriff and Keyes, were started in 1942 and 1945, when the company had limited pipeline capacity in its southeastern New Mexico district and needed gas stored close to the market for peak demands.

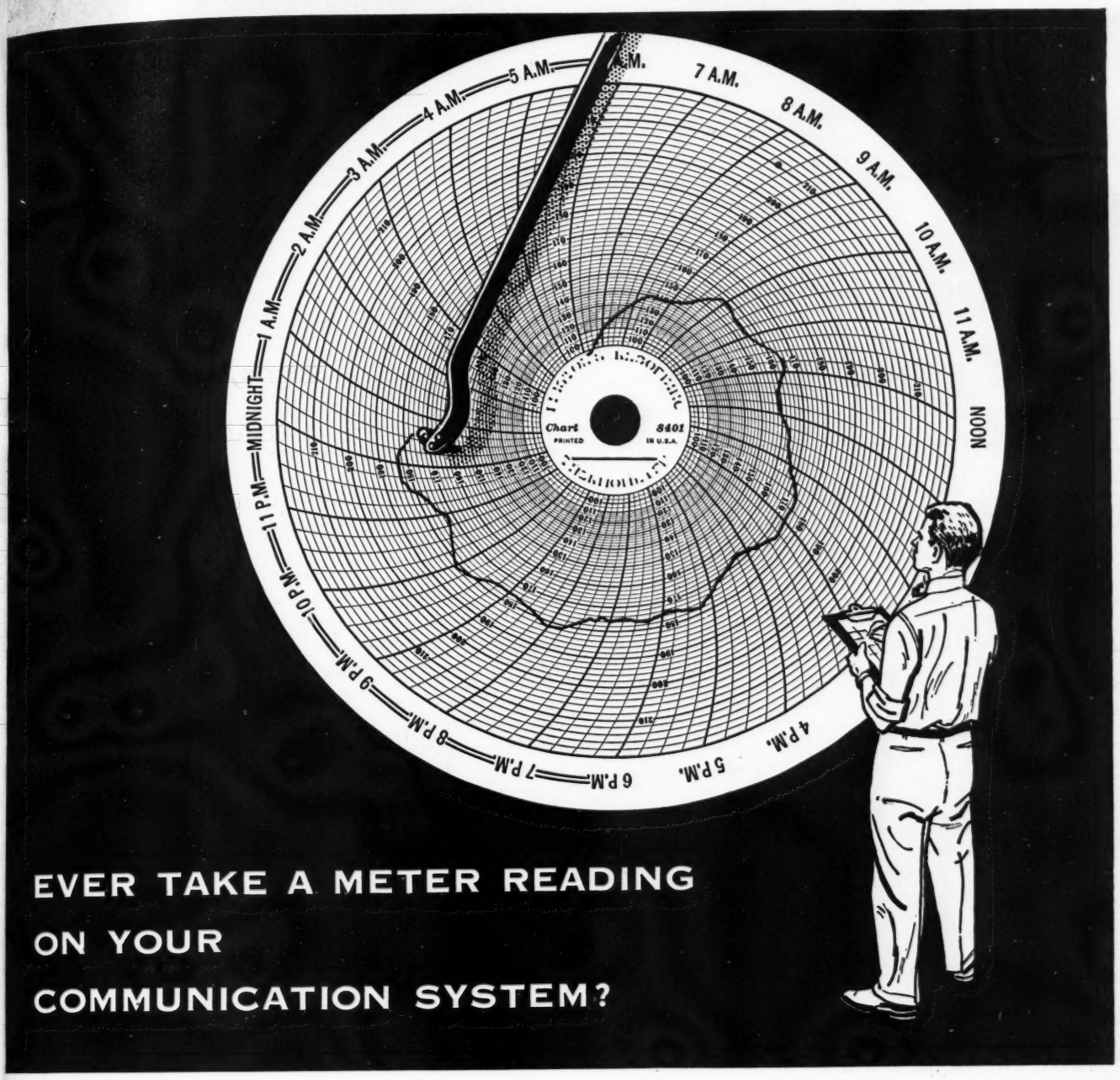
Located right in the heart of the southeastern New Mexico district, near Carlsbad, Artesia, and other cities served by Southern Union, the projects are still used as an insurance against peak requirements.

The company feels that underground storage, permitting speedy withdrawals when needed and an accumulation of available gas, is economical, is in large part the answer to supplemental supply for peak demands and emergencies, and is a means of assuring consumers of better natural gas service.

Right now, Southern Union is giving consideration to an additional storage project in the Dakota sands in the San Juan Basin near Barker Dome.

The company's rapid growth and expansion during the past few years necessitated the creation in 1951 of an exploration department, headed by Van Thompson, veteran Southern Union engineer. A. M. Wiederkehr, a member of the department, is reservoir engineer in charge of underground storage.

Southern Union, with headquarters in Dallas, serves 25 towns and cities in New Mexico and one city in Colorado, providing much of the gas supply for its customers in those states. Nine Arizona towns and 20 cities and communities in Texas, making a total of 55, with 238,000 customers, complete the Southern Union system. All of the gas for Arizona and most of the supply for Texas cities is purchased by Southern Union from pipeline companies.



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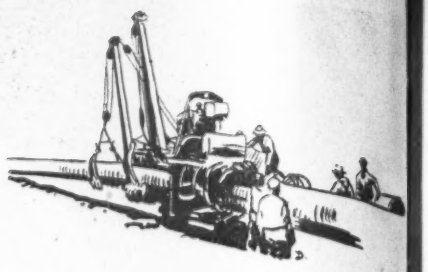

Hurdles to clear in obtaining a fair price for gas

The matter of obtaining a fair market value for natural gas has been weighing heavily upon the best minds in the gas business ever since war's end, when the cost spiral began to choke the industry. More recently, the "regulatory lag" in rate cases has compounded the problem.

On both of these matters, much has been said from the podium, and duly reported. Each speaker, on each occasion, introduces some fresh thoughts; so, also, did C. P. Rather, president of Southern Natural Gas Co. and INGAA, speaking before a recent meeting of the National Federation of Financial Analysts Societies. The following report excerpts and abridges his talk:

THE low price and other advantages of natural gas have created a demand that tends to make it supply the entire fuel requirements of the country. That simply cannot be done. Natural gas supplies are short because markets are growing faster than pipelines can be built; because the producer is slow to sell to interstate pipeline companies because of fear of regulation, with the result that new supplies are increasingly difficult to obtain; and because natural gas companies are slow to expand when such expansion necessitates rate increases that might be so slow in materializing as to seriously jeopardize earnings.

Cures for shortage

The shortage might be cured if a more balanced fuel economy could be established as the result of increasing the price of gas; convincing producers that they will be free from regulation while they sell to interstate pipeline companies; assuring natural gas companies of prompt action and reasonable treatment in establishing rates necessary to support expansion; and encouraging them to find and produce a larger portion of their supplies.

Natural gas supplies have increased in recent months, what with the FPC decision in the Phillips case. Prices, too, have increased, but no balanced fuel economy has resulted. The "regulatory lag" has not been cured.

Complex situation

Consider the supply problem at its source—the producer. Largest of these are the oil companies, complex industrial organizations only one part of whose many activities is exploration for their supply of raw materials. Sometimes one discovers oil, sometimes gas. Both may exist in the same field, or reservoir, or even the same hole.

How would you regulate such a business? Surely not by applying those regulatory principles applied to public utilities. Would regulation apply to all of the business or just the natural gas portion? If only part, how would costs be allocated, particularly exploration costs? Would only a few producers be regulated, or all of them? If only a few, where would you draw the line? How many people and how much of a bureaucracy would it take to do the job?

The threat of regulation has caused large natural gas reserves to be held off the market, and the field price has increased because of this.

As for the policy of FPC in pricing gas owned, produced, and gathered by natural gas companies admittedly subject to its jurisdiction, whereby gas is priced on the basis of original cost of property involved (less depreciation and depletion) applying to the base the utility rate of return, this was established principally in the Canadian River-Colorado Interstate and Colorado Wyoming Gas Co. case, decided March 18, 1942. Yet the Supreme Court's decision upholding FPC stated that "We do not say the commission lacks the authority to depart from the rate base method." I conclude FPC may still determine how such gas should be priced.

The natural gas company takes the same risks and operates under the same competition as the independent producer in the field. It should be encouraged to place itself in a competitive position by owning a substantial portion of the reserves necessary for operation of its pipeline in order to be in a better bargaining position for supplies.

Natural gas plentiful

Certainly there is no shortage of natural gas. AGA reserves reports show this. And W. C. Spooner, a Shreveport geologist, predicts that "not less than 25 trillion cu ft of reserves (in the south Louisiana Gulf Coast area alone) are *undiscovered*. Marketed gas is now about 600 billion per year, and will probably reach 1 trillion in 1960 . . . The price is nearly stabilized at 20 cents and when current pipeline projects are completed there will be gas available at less, particularly from the smaller reserves."

The issuance by FPC of construction certificates should and could be speeded up if proceedings were shortened. Too often the commission staff takes an adversary position. Yet the proceeding is not an adversary one; it is an investigation to determine facts. Many facts could be determined in conference and incorporated in the record by stipulation without the time-consuming examina-

tion and cross-examination of witnesses. Intervenors should not be permitted to stretch out hearings indefinitely with interminable questions having little, if any, bearing even on their own special interests.

The Natural Gas Act requires the commission to hold hearings on all certificate applications. This mandatory provision should be eliminated.

Duplication of jurisdiction such as was upheld in the East Ohio case (*GAS*, July 1951, pages 32-34) should be eliminated.

Rules need reviewing

The commission should review its certificate application rules. Certain requirements could be simplified and changes could be made that would speed up proceedings without handicapping the commission. Although the express purpose of new rules relating to the form and filing of applications which became effective last September, is to improve the efficiency of handling gas certificate applications, they require the submission of large masses of details that could be simplified, e.g., flow diagrams and supporting data, market data, and financing, including cash flow statements, pro forma balance sheets and income statements, etc. Unless an application involves a dispute between two operating companies, the management of an operating company should be given some credit for filing an application that would not jeopardize the financial integrity of that company. Rules that must be rigid for new companies should be simplified for established ones.

The Natural Gas Act's provision that rates must be "just and reasonable" permits broad discretion, and the courts have recognized this. The staff interprets these words to mean "lowest possible rate." The commission, sitting in a judicial position, seems to have followed the approach of the staff. The "lowest possible rate" is contrary to the public interest in that it deprives the public of natural gas at prices that are attractive even though they are higher.

The regulatory lag problem is a difficult one, but it is susceptible of at least partial solution and this can well be accomplished in conjunction with the new set of rules governing rate increase filings which the commission has under consideration. These tentative rules require the filing of specified, voluminous data along with the new rates.

The industry has argued vigorously against them and against the staff view that any filing not strictly in accord with them can be summarily rejected.

The burden of proof is on the filing company to sustain its proposed new rates. It should not be circumscribed in presenting any arguments or facts that support its views. The staff is entitled to all pertinent information with regard to the company's business but the rules setting out the data to be supplied should not be so slanted as practically to forecast and compel the results which would be arrived at by the application of principles with which the company is not in accord.

The industry feels that if the rules are so drafted as to permit filing time sufficient in advance of the impact of increased costs as to make possible conferences between representatives of the staff and the company, the areas of disagreement can be delineated and the non-controversial portion of the increase determined.

Filings not frivolous

I think it should be obvious that no natural gas company, in view of all the difficulties involved, would make a frivolous rate increase filing. Certainly some part of the increase cannot be contested. That part should be determined by using the conference procedure and should be permitted to become effective, without suspension, by the commission.

I understand there is debate within the staff of the commission as to whether a rate application can be partially suspended by the commission under the provision of the Natural Gas Act. Counsel in whom I have confidence express the opinion that such partial suspension is permissible under the Act.

There is one way of partially curing the regulatory lag which I think should be explored. In the rules under the Federal Power Act the commission does not prohibit so-called "fuel clauses" in electric rates whereby increased fuel costs are more or less automatically passed on to the purchaser of electricity.

It seems to me that the cost of gas to a pipeline company and to a distribution company has many of the same characteristics as the cost of fuel in electric generation. In fact, it seems even more appropriate to permit automatic interim rate adjustments based on changes in the cost of purchased gas, since gas costs generally are fixed by long term contracts and are reasonably stabilized while the cost of other fuels used in electric generation fluctuate with the market.

Pipeline News

Gathering tax appeal ready for U. S. Supreme Court

Respective defense pleas and appeals to the U. S. Supreme Court have been completed by Texas Atty. Gen. John Ben Shepperd and counsel for the two natural gas pipeline companies contesting the gas gathering tax. (See July *GAS*, p. 118.) But the court is in summer recess and no announcement of whether it will accept the test cases for review is expected before fall.

Mr. Shepperd will tell the court that the Texas natural gas gathering tax, upheld by the state supreme court, is an effort to make the industry bear an equitable share of the state government cost. Backed by the heads of several state agencies, he has asked the court to deny an attempted appeal by Panhandle Eastern Pipe Line Co. and Michigan-Wisconsin Pipe Line Co., or to affirm the state appellate court's opinion that the tax is constitutional.

On the other hand, Michigan-Wisconsin and Panhandle will hold that the only issue is whether the tax is a burden on interstate commerce and therefore unconstitutional. The companies said the tax was "deliberately aimed at gas moving in interstate commerce: it was designed to produce revenue for the state of Texas by exacting a toll from interstate commerce.

"Since the burden of the tax ultimately will be borne by those persons in other states who consume gas, the statute enables . . . Texas to achieve the politically popular result of raising revenue at the ultimate expense of citizens of other states," the appeals continued.

Mr. Shepperd declared the courts have upheld the rights of states to place nondiscriminatory taxes on interstate commerce where the state provides benefits in relationship to the tax. Without Texas Railroad Commission regulation under the Texas oil and gas conservation laws, gas pipelines could not exist, he said.

If the tax is upheld, a backlog of nearly $17 million paid by 117 companies under protest will help effect pay increases for 40,000 state employees and possibly 51,000 public school teachers in Texas. The tax amounts to about $1 million per month.

Columbia system plans lines to receive gas from Gulf

Applications were filed last month by four Columbia Gas System subsidiaries for authorization to construct facilities which will enable them to receive and transport gas from the Gulf Interstate Gas Co. line. (See July *GAS*, p. 112.)

United Fuel Gas Co. and Central Kentucky Natural Gas Co., Charleston, filed jointly to construct about 92 miles of line and a 6000-hp compressor station at an esti-

mated cost of $10,649,768. United would build 60 miles of 30-in. mainline westward from its Lanham station in Putnam county, W. Va., to a connection with Gulf's system in Boyd county, Ky. The 6000-hp compressor station with 2½ miles of suction and discharge lines would be near Kenova, W. Va. A 6-mile, 20-in. lateral would extend north from this station to Burlington, Ohio, and 20 miles of 20-in. line from Calhoun to Roane counties, W. Va. Central Kentucky's portion includes 5 miles of 20-in. lateral from a connection with Gulf's system in Menifee county, Ky. to Central's Means (Ky.) compressor station.

Ohio Fuel Gas Co. of Columbus plans to build a total of 69 miles of line and two additional 1500-hp units at its Crawford compressor station, all in Ohio. Cost of its project will be $4,768,700. Ohio would connect to United at Burlington with a 2.2-mile, 20-in. line; build a 26.3-mile, 20-in. line from Oak Hill to McArthur; a 29-mile, 24-in. line from McArthur to its Crawford station; and an 11.3-mile, 20-in. line in Licking county.

Manufacturers Light & Heat Co., Pittsburgh, plans a project to cost $3,553,446. It would include about 72 miles of line, a compressor station and two measuring and regulating stations. The line would consist of 12.7 miles of 20-in. in Doddridge and Wetzel counties, W. Va.; 21 miles of 16-in. in Wetzel and Marshall counties; and about 38.7 miles of gas storage and well lines. Activation of the Victory storage field in connection with this plan would require the 1760-hp compressor station, and two measuring and regulating stations.

Fluor of Canada acquires interest in Ontario firm

Fluor of Canada, subsidiary of Fluor Corp. Ltd., Los Angeles, has further integrated its engineering and construction services in Canada by the purchase of an interest in H. G. Acres & Co., consulting engineers of Niagara Falls, Ontario.

Under terms of the agreement, Fluor will have the services of the highly trained Acres technical staff of about 300 structural, mechanical, hydraulic, and electrical engineers. This group will be supplemented with chemical and petroleum technicians from Fluor's Los Angeles offices. No change in policy, management, personnel, or company name of Acres is contemplated.

Companies protest Kansas' new gas measurement order

Three major natural gas companies filed suits in Topeka district court last month protesting a new state order controlling measurement of gas which they claim will increase their costs. Plaintiffs are Cities Service Gas Co., Panhandle Eastern Pipeline Co. and Kansas-Nebraska Natural Gas Co. Inc. Defendants in the cases are the Kansas Corporation Commission and its members—Jeff Robertson, DeWitt M. Stiles and Charles M. Warren.

The three companies asked the district court for a declaratory judgment and injunctive relief from a commission order which was effective July 1. The order defined a cubic foot of gas as that volume of gas at a temperature of 60° F required to fill 1 cu ft of space under an absolute pressure of 14.65 lbs with corrections for deviations.

Under the old method of measurement, a cubic foot of gas was that volume at 60° F required to fill a cubic foot of space under a pressure of 16.4 lbs. Kansas-Nebraska claims the order has the effect of increasing the number of cubic feet about 11.95%. This means the companies are getting less gas for the same price, or they are paying a higher price for the same amount of gas.

Court order promotes gas gathering in Spraberry

Effect of the Texas supreme court's final decision last month in the Spraberry flare-gas case apparently will be to promote extension of gas gathering lines to unconnected wells to utilize the casinghead gas as rapidly as possible. The court voided the Railroad Commission's shutdown order. Immediately following the decision the commission issued an emergency order prorating oil production among all wells to allow production of only as much casinghead gas as can be put to legal use. This order allowed about nine producing days for July.

Evidence that the order was attaining the desired effect of spreading the gas outlet to all wells in the trend was reflected in Phillips Petroleum Co.'s agreement to tender gas gathered by it to available plants in the area.

Spraberry Trend producers became involved when the commission ordered the closing of 2200 wells in the area to prevent waste of gas by flaring. When five law suits were filed protesting the blanket order, District Judge Charles O. Betts ruled that wells not flaring gas could continue production, but the commission argued the area must be considered as a unit. It said this measure was to protect the property rights of all operators to recover their proportionate share of oil.

SoCounties seeks to build new line to Santa Ana

Southern Counties Gas Co. of California, Los Angeles, has filed an application with FPC for authority to construct a pipeline about 14 miles long to provide additional capacity for Orange county consumers.

The proposed line, to cost $879,962, would include about 72,000 ft of 24-in. pipe and 1000 ft of 22-in. pipe, extending from a point on the company's existing 30-in. Blythe-Santa Fe Springs pipeline near Brea to Santa Ana. It would have a capacity of more than 5.06 MMcf per hour, which is approximately twice the maximum capacity of the existing facilities to Orange county.

Rate actions include $14 million settlement plan

Among actions on the rate scene last month, which included three new applications for increases and several scheduled hearings, was one possible settlement of a proposed $17,850,000 increase reduced to $14 million.

The Tennessee Gas Transmission Co. submitted a proposal providing for an annual increase of $14 million to replace the $17,850,000 originally requested. The agreement, made with its wholesale customers, provides for basic rates ranging from 20.39 cents per Mcf in the southern zone—states south of Kentucky—to 34.74 cents in the New York zone.

New requests filed include Northern Natural Gas Co.'s proposed $12,609,000, an increase of 21% based on estimated sales for 1954; a $5,857,600 increase proposed by Texas Illinois Natural Gas Pipeline Co.; and $1,778,000 annually, being requested by United Gas Pipe Line Co., Shreveport.

The FPC consolidated proceedings on Manufacturers Light & Heat Co. and Home Gas Co.'s applications, under suspension since May 22, for $1,343,000 and $287,000, respectively, with increases being collected under bond since November. Subject to refund, Manufacturers has been collecting rates amounting to $2.2 million annually, and Home, $1,242,000.

El Paso permit will boost Cal receipts to 1.4 billion

Construction is already being pushed after FPC's approval of projects to cost $210 million. The project is designed to increase El Paso Natural Gas Co.'s system by 400 MMcf daily and California companies' systems by a total of 300 MMcf daily. El Paso's system will then have a total capacity of more than 1910 MMcf of gas per day, more than 1.4 billion cu ft of which will be delivered to the California companies. Completion of the projects in 1954 will bring the total investment in the Texas-California pipeline project to more than $500 million.

Modifying a former order which limited El Paso's delivery to customers in Texas, New Mexico, Arizona, and California, FPC granted the company a permit to construct 1056 miles of line and 161,860-hp in compressor capacity at a cost of approximately $175 million. This will allow it to carry an additional 300 MMcf from the Permian basin and 100 MMcf from the San Juan basin. Of this, 300 MMcf will be divided equally between Pacific Gas & Electric Co. in northern California, and Southern California and Southern Counties Gas Co.'s in southern California. Another 100 MMcf will

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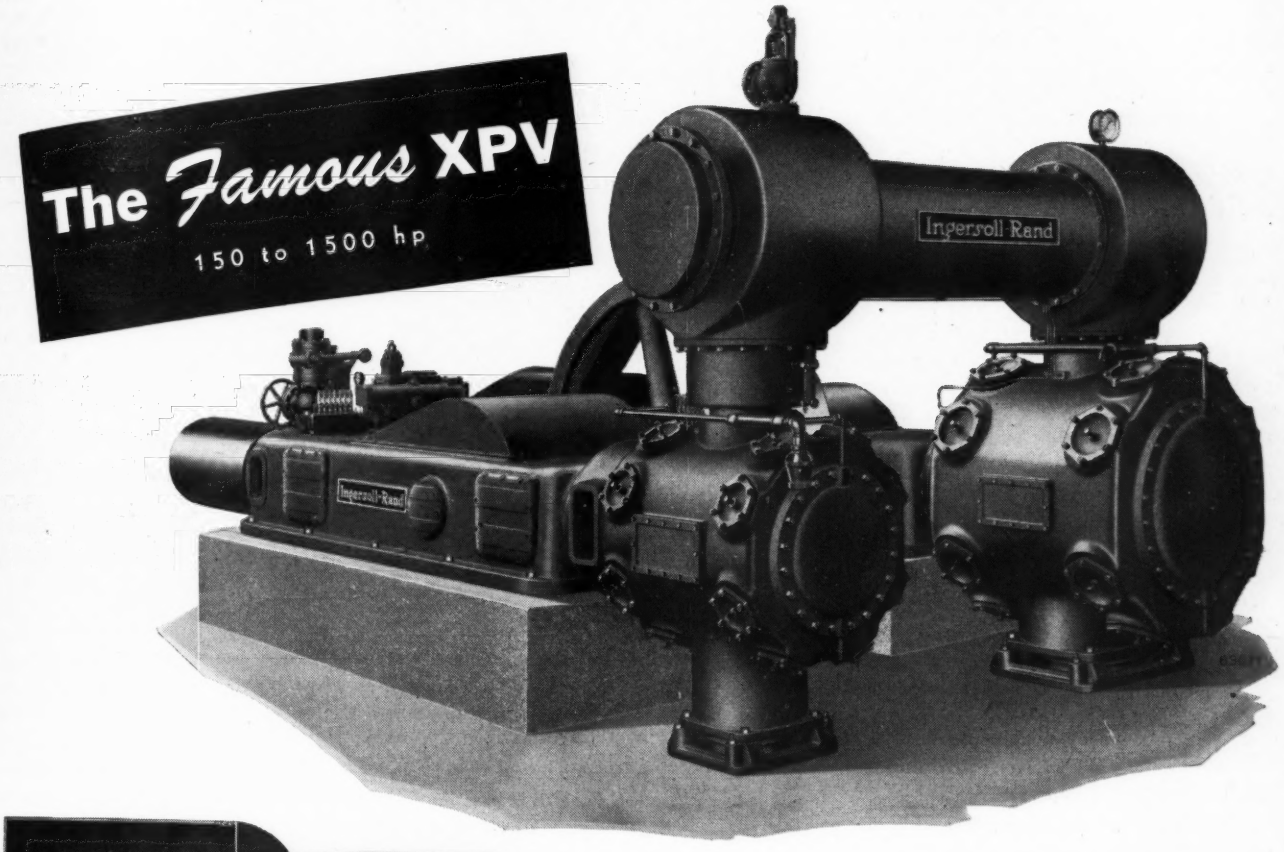

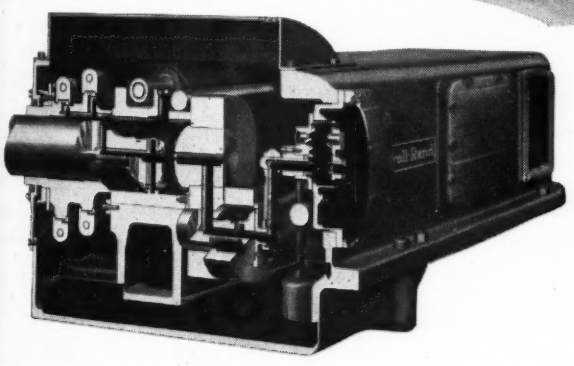

This cross-section through one of the main bearings of the new XPV shows its unique lubrication system. The combination oil-pump drive and distribution system (patented) supplies oil through drilled passages directly to the crankpin and main bearings, valve-gear eccentrics, and crossheads.

All of the oil discharged from the pump passes through a fine-mesh bronze filter before entering the distribution system. The oil stays clean and bearing surfaces are protected.

Because the frame is sealed, oil stays in; and dust and dirt stay out. The oil in the crankcase keeps clean, and the smooth contours of the frame make it easier to keep clean outside.

Ever since the first steam-powered compressor of "4-corner" construction was built by Ingersoll-Rand in 1900, I-R "steamers" have been the standard of comparison. Through the following years, other models introduced such precedent-breaking improvements as: balanced piston-valve riding cut-off steam end, double-crosshead and tie-rod construction, and Channel Compressor Valves.

The new XPV sets a truly new standard of comparison. Many of the outstanding features of the old XPV have been retained because of their advantages. Many improvements have been introduced to make a superior compressor.

One of the outstanding features of the new XPV is its full-floating bearings. Main, crankpin, and crosshead-pin bearings are all free to rotate; rubbing speeds are reduced, and bearing loads and lubricant are distributed evenly around the entire bearing surface both inside and out. The wear on these non-adjustable bearings is almost non-existent, and the sealed, dust-tight frame need be opened only for inspection.

Part by part, and as a complete unit, the new XPV has been designed to compress air or gas with the greatest over-all efficiency. For further information ask the nearest I-R branch office for Bulletin 3444-A. Call upon Ingersoll-Rand engineers to prove why you should use this new XPV, the new standard of comparison.

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go to customers in west Texas, New Mexico and Arizona.

The commission also granted the Pacific Gas & Electric Co. permission to add approximately 227 miles of line and 2500-hp compressor capacity to its system at an estimated cost of $26,721,435.

Southern California Gas Co. and Southern Counties Gas Co. jointly will construct 73 miles of loop on their existing Blythe-Los Angeles line and 5280 hp additional in compressor facilities. Their project will cost approximately $7,482,194.

Contracts superseded by minimum price order

Judge Stephens Chandler ruled last month in the Federal district court in Oklahoma City that orders of the Oklahoma Corporation Commission fixing minimum prices for natural gas superseded original contracts between producers and purchasers. The court granted judgment of $387,282 to the Cabot Carbon Co. against Phillips Petroleum Co. The suit involved a contract in Guymon-Hugoton field of Texas county, Okla.

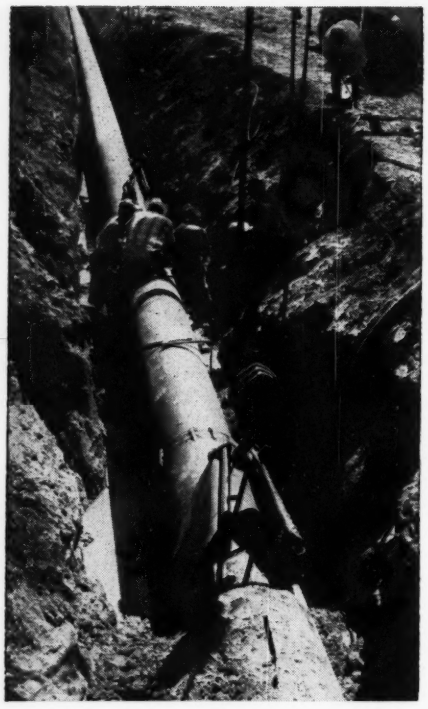
Under contract of March 1944, Cabot turned a block of leases to Phillips for development, retaining a one-fourth overriding interest; Phillips was to pay Cabot four cents per Mcf for gas produced. On Jan. 1, 1947, the corporation commission issued an order prohibiting production of gas at less than seven cents per Mcf. On Aug. 1, 1952, a second order prohibited production at less than 9.8242 cents per Mcf. The original order has been upheld by superior courts.

Cabot sued for the higher price. Judge Chandler held the producer is bound by the corporation commission rate and does not own the gas until it is produced, thus "the contract is superseded by the commission's order."

Canada prefers costly gas for east to further export

Canada's Trade Minister Howe is standing pat on the policy of no gas to the United States until "we are convinced there can be no economic use . . . for that gas within Canada." Meanwhile Union Gas Co. of Canada's president, David P. Rogers, says Alberta gas "won't be cheap for Ontario," and two U. S. companies are trying to get FPC approval to transport gas to the Toronto area.

Despite statements made recently to the Alberta Natural Resources Board about the impracticability of building a line from Alberta to Ontario and Quebec, Mr. Howe reaffirmed the government's policy of last March. He said the government favored the extension of the Westcoast line into the Pacific Northwest states, but with that one exception, its policy "is to refuse permits for moving gas by pipeline across the international boundary." Rumors had been circulating that the policy would be changed after the election. But in a formal statement Mr. Howe said, "It is the view . . . that [the government's] declared policy against export . . . is in the national interest and that policy will be continued without change."



Workmen of G. G. Griffis Inc. here make a weld on a portion of Northern Natural Gas Co. pipeline in Iowa.

Alberta natural gas will be of tremendous advantage to eastern Canada, if brought east in large quantities and on a sound economic basis, Mr. Rogers told his company at its annual meeting in Chatham, Ont. That gas will not be cheap gas, he added, as surveys indicate the average wholesale cost will be between 57.7 and 71.2 cents per Mcf.

An application of Tennessee Gas Transmission Co. and Niagara Gas Transmission Ltd., a subsidiary of Consumers Gas Co. of Toronto, was before the Federal Power Commission last month proposing to bring Texas and Louisiana gas to Toronto. The companies have entered into a contract to buy the U. S. gas subject to approval of authorities.

Colorado Interstate's $20 million project authorized

Approval was granted last month for Colorado Interstate Gas Co.'s construction project to cost $19,856,596. The program will complete looping of the present Hugoton-Denver line, several laterals and field lines. It also includes installation of 18,920-hp additional compressor power for increase in capacity and 5940-hp for supply. The project will add 82.5 MMcf to the present capacity of 426.3 MMcf per day bringing the total to 508.8 MMcf for use in the 1953-54 heating season.

Mainline additions to be constructed include a 49-mile, 20-in. loop from a point near Hugo, Colo., to the Kit Carson compressor station; 26.4 miles of 8-in. loop on the existing line between the Denver-Amarillo transmission line and Canon City, Colo.; 10.6 miles of 16-in. loop on the line between the Denver-Amarillo mainline and South Pueblo, Colo. Mainline compressor additions will include 1320 hp at the Kit Carson, Colo., station, and 5280 hp at each of two stations in Moore county, Texas—the Fourway and the Bivins. Two new stations, the Keyes in Cimarron county, Okla., and the Springfield in Prowers county, Colo., will have 5280 hp each.

Five miles of 16-in. line will be laid between a new Sanford compressor station, to have 3960 hp and a desulfurization plant and the Panhandle gas field. Thirty miles of 12-in. line will connect the existing 20-in. Hugoton-Denver mainline with a new 1980-hp compressor station in Morton county, Kan. Both of the stations will add to Interstate's supply.

Also approved were 112 miles of field pipelines ranging from 4 to 20 in.

FPC to hear plans to serve four Georgia communities

A consolidated hearing has been scheduled by FPC for applications by Chattahoochee Natural Gas Co. and Southern Natural Gas Co., both of Birmingham, Ala., proposing construction of gas pipeline and facilities in Georgia.

Chattahoochee plans to build a 70-mile line to supply gas to four communities in northwest Georgia and Southern Natural has requested authority to build a line tap and metering and regulating facilities to supply Chattahoochee.

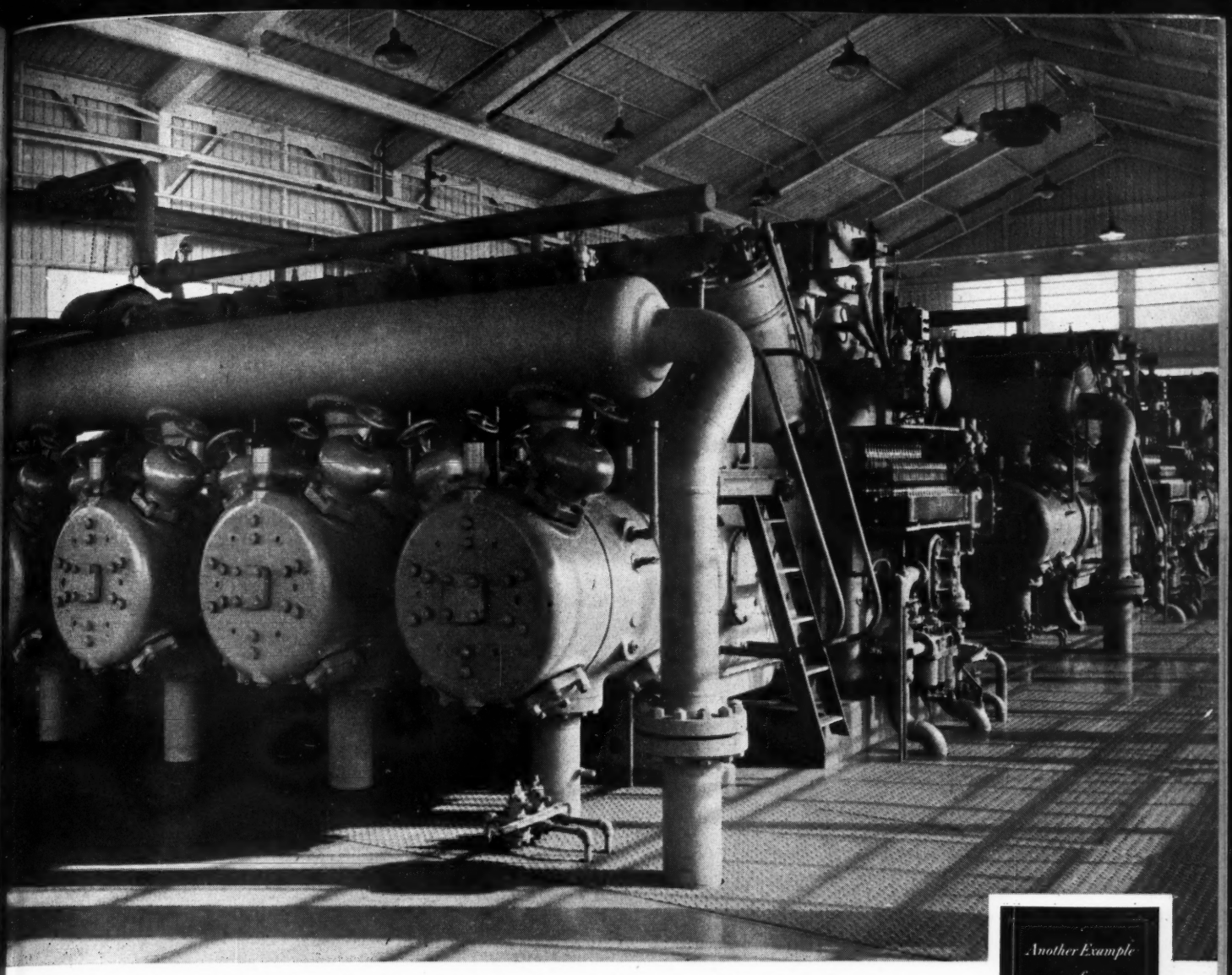
To serve Trion, Summerville, LaFayette and Dalton, Chattahoochee would connect with Southern Natural's system at a point near Rome, Ga. Estimated cost of the line is $1,510,828. Southern's facilities are estimated to cost $31,000.

Laclede finds oil traces in gas storage test well

The Laclede Gas Co., St. Louis, has encountered shows of oil in a test drilling about 15 miles north of St. Louis where the company plans to develop a gas storage area. The well is one of a series begun last October to determine the feasibility of use of the area as a storage reservoir. If it is successful, the project is expected to cost about $10 million.

Robert W. Otto, president, said, "It is at this time impossible to assess the potential of oil in this area with any degree of accuracy whatsoever." He said that cores and electro-logs from some zones in the Trenton limestone at about 1029 ft showed some oil saturation and porosity. Because the well was being drilled for gas storage, no test of the oil potentiality was made.

A consulting oil and gas geologist, who



Line-up of three 1100 hp Cooper-Bessemer GMV's at Equitable Gas Company's D. P. Hartson station, built by the Fluor Corp. A similar station, Pratt, designed by Stone and Webster and built by Equitable, has four GMV-8's rated 880 hp each.

Another Example of Efficient Power at Lower Cost

3-Way Economy for Equitable Gas

. . . with this modern GMV line-up

EQUITABLE GAS COMPANY'S D. P. Hartson Station, south of Pittsburgh, pumps 25 million cubic feet of gas daily from transmission lines into underground storage. It is typical of stations everywhere enjoying multiple savings with modern Cooper-Bessemer V-angle compressors.

Fuel economy . . . Today, Cooper-Bessemer V-angle engines offer the highest thermal efficiencies ever reached. With fuel consumption guaranteed as low as 8500 B.T.U./bhp/hr, it's the same as buying your gas at lower rates!

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is advising Laclede on the development of its gas storage program, pointed out that the Trenton limestone formation is "notoriously spotty" and that several other independently drilled wells had been dry and the area had been abandoned as a possible oil territory. Laclede, however, is attempting to acquire mineral rights in the area in case it may later prove to have some commercial value.

Carthage Hydrocol synthetic gasoline plant closed

The multi-million dollar, government-financed Carthage Hydrocol plant at Brownsville, Texas, where synthetic gasoline is produced by a secret process, has been ordered closed down. The plant produced gasoline and chemicals from natural gas and oxygen in what was supposed to be the first commercial application of a new process.

A brief notice posted at the plant said it was discontinuing operations "for the present." No official explanation was made. One official who would not be quoted by name said the plant never did achieve commercial production, but that the reason for shutdown was mechanical difficulty.

United will add compressor and line at storage field

FPC has authorized United Fuel Gas Co., Charleston, W. Va., to construct about 18 miles of pipeline and a new compressor station to be used in operation of a new natural gas storage pool near Limestone in Wood and Wirt counties, W. Va.

The line will extend from a connection with an existing line at the company's storage pool near Ripley in Putnam county to its storage pool in Limestone. The compressor station, which will have three 880-hp units, each supercharged to 1100 hp, will be located at the Limestone pool.

Construction of these facilities had been proposed as part of the company's application to develop the storage pool in Putnam county, which was authorized by FPC March 23. The commission had deferred decision on the 18-mile line and station.

The station is designed to inject up to 10 billion cu ft at 1400 psi into the storage pool. Cost of the line is about $1,075,850 and the compressor station $2.5 million, a total of $3,557,850.

Rehearing granted on South Georgia 335-mile system

FPC has granted a request by South Georgia Natural Gas Co., Birmingham, Ala., for rehearing of an order issued May 4 denying the company authorization to build a natural gas transmission line to serve Georgia and Florida markets.

The application for rehearing contained additional factors which may change the basic facts on which the denial was issued, the commission said. Among them were revised market estimates, an accelerated depreciation certificate for income tax purposes, a reduction in proposed resale rates, and new studies on the economic feasibility of the proposed municipal distribution systems.

The system would include 335 miles of line extending southeast from a point on Southern Natural Gas Co.'s system in Lee county, Ala. Cost of construction is estimated at $8,141,518.

Ohio Fuel's sixth storage area nearing completion

A million dollar pipeline project at the Holmes storage area is nearing completion to make Ohio Fuel Gas Co.'s sixth underground storage area in the state. Five pools in Holmes, Ashland, and Wayne counties make up the area. The new storage will increase Ohio Fuel's capacity by 8.2 billion cu ft.

A 15-mile, 20-in. line connecting the storage area to the company's Weaver compressor station in Richland county is being completed by the Shamrock Construction Co., Lansing, Mich. Ohio Fuel crews are laying about five miles of smaller lines to connect wells in the storage area with the main 20-in. transmission line. Preliminary work for a new compressor station has just been completed.

First major gas line in Saskatchewan completed

Construction of the first major gas system to be built in Saskatchewan is nearing completion. The 101-mile transmission line from Brock to Saskatoon was completed early last month and work on the distribution system in Saskatoon is slightly ahead of schedule.

The Williams Brothers (Canada) Corp. expects to have some gas flowing to homes in Saskatoon before the Oct. 15 time limit originally set by the company. Over 700 homes are already connected to distribution mains and applications have passed the 4100 mark. The Saskatchewan Power Corp., owners of the system, expect to reach their goal of 6000 residential and commercial services before gas is turned on.

Fluor at work on Warren natural gasoline plant

Construction has begun on Warren Petroleum Corp.'s Saunders natural gasoline plant about 17 miles northwest of Lovington, N. M. The plant being constructed by the Fluor Corp. Ltd., Los Angeles, will process gas from the Bagley, Hightower, Lazy J, North Saunders, and Saunders pools and any new pools developed in the northwest corner of Lea county.

The initial installation will include facilities to gather and process approximately 22 MMcf of gas daily with a daily average production of 30,000 gals. of natural gasoline, 15,000 gals. of butanes, and 31,000 gals. of propane. About 16 MMcf of residue gas will be delivered to a transmission line. The light hydrocarbons will be recovered as a mixture which will be pumped through a 35-mile line to Warren's Monument, N. M., plant for final separation and processing.

Compressor facilities will consist of five 1350-hp angle type gas engine units, but plant design provides for potential doubling of plant's capacity by installing additional compressors and making minor changes, if future developments should justify such expansion.

El Paso acquisition of West Texas facilities approved

A series of related applications of El Paso Natural Gas Co. were granted by decision of an FPC presiding examiner last month. The order will allow El Paso to acquire pipeline facilities from West Texas Gas Co., Lubbock, now used by that company to supply natural gas to Southern Union Gas Co., Dallas. The gas which West Texas sells to Southern Union is purchased from El Paso and the transaction will eliminate West Texas as a "middle man."

Facilities involved include 348,066 ft of line from a point near Umbarger to a point near the Texas-New Mexico line; about 236,126 ft of line between Amherst and connection with the first line in Parmer county; and a 600-hp compressor station near Hereford, all in Texas. El Paso will pay $287,389 for the facilities. In addition it will acquire about 445 ft of line from Southern Union and construct a new metering station at a cost of $3500.

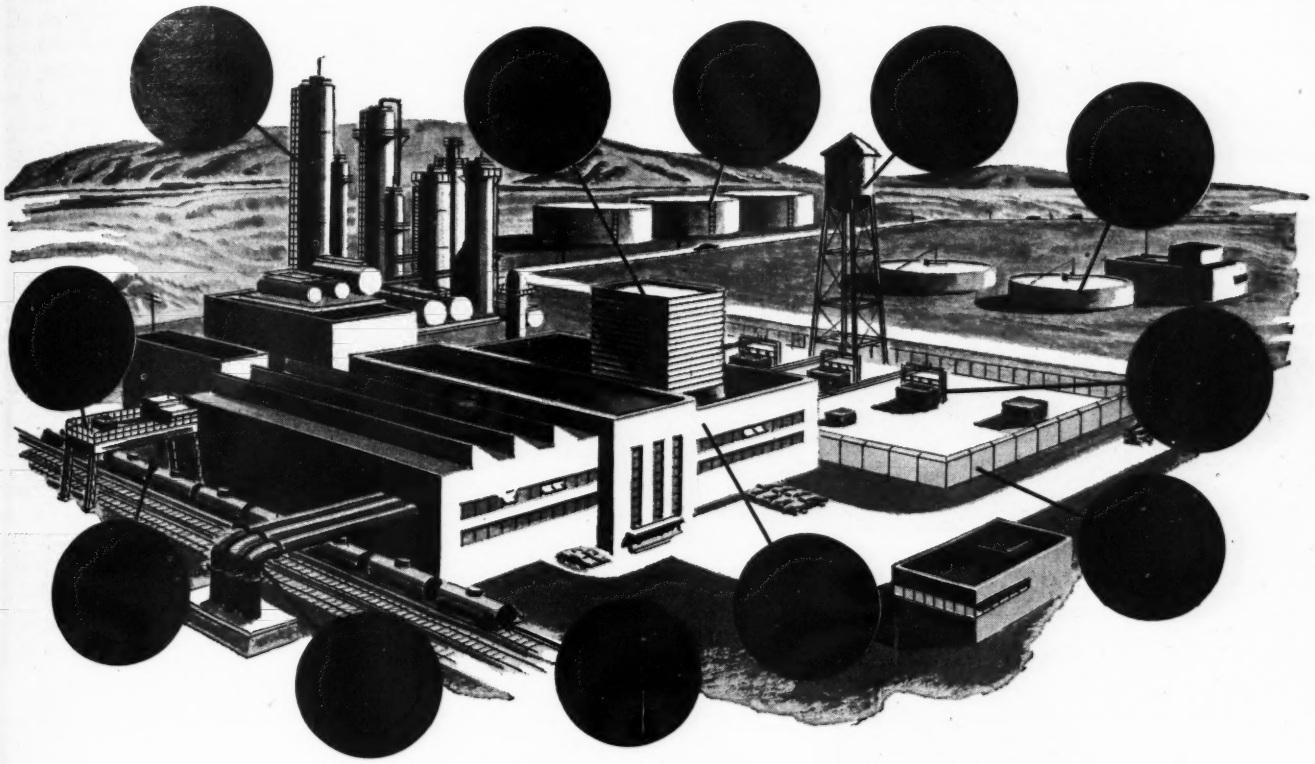
Houston firm plans for huge line to be submitted to FPC

Plans for the Houston Texas Gas & Oil Co. to be submitted to FPC shortly have been expanded to include construction of about 2300 miles of line. The system will consist of two lines totaling over 2000 miles of 30-in. pipe and about 300 miles of laterals and gathering lines.

One line will begin near the Rio Grande river in Texas and join the other, which will begin in the coastal tidelands of Louisiana, in northern Mississippi. They will run parallel to a point in Ohio where one will continue north and the other branch through Pennsylvania and into New York. Initial capacity of each line is expected to be 450 MMcf, a total of 900 MMcf daily. Estimated cost of the system is over $300 million.

J. O. Mack is president of the company; A. R. Kleinkauf, vice president and assistant to the president; and H. S. Mack, secretary-treasurer.

HERE'S A DOZEN GOOD PLACES TO START CUTTING CORROSION COSTS



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Notes

FPC has issued notice of a proposed rule to amend its Uniform System of Accounts to provide a new account for future income taxes resulting from accelerated amortization. Oral argument on the proposed rule will be heard Sept. 9 and interested parties have until Aug. 19 to submit their views and comments.

The Fredericksburg (Va.) Natural Gas Co. has filed a notice of withdrawal of its application for authority to construct a 29-mile pipeline to transport natural gas to Fredericksburg. The notice said the company had been unable to perfect arrangements for a firm supply of gas for the project.

Rehearing has been granted by FPC in the case of Panhandle Eastern Pipe Line Co. and Indiana Gas & Water Co. Panhandle had been granted permission to operate a portion of line built by Indiana Gas and directed to make certain changes in service. Date for the rehearing will be set by further order.

Claude L. Draper of Wyoming has been unanimously elected vice chairman of the Federal Power Commission to serve the remainder of 1953. He succeeds Harrington Wimberly, whose term as a member of the commission expired June 22. In point of service, Commissioner Draper is dean of the FPC. He was appointed by President Hoover in 1930.

Iroquois Gas Corp., Buffalo, N. Y., plans to spend $800,000 to develop another underground storage field for natural gas which will hold about 1.6 billion cu ft of gas and bring its total storage field capacity to 14 billion cu ft. Iroquois will accept constant deliveries throughout the spring, summer and fall months to build up the reserve for use during winter peak periods.

Announcement was made last month of the transfer of control of Interstate Natural Gas Co., Monroe, La. Olin Industries Inc., East Alton, Ill., has bought 770,000 shares, about 81%, of Interstate's outstanding shares. In its acquisition Olin purchased the interests of Standard Oil of N. J., which formerly controlled Interstate; American Republic Corp.; and Columbian Carbon Co.

Allan Edwards Inc., Tulsa, has acquired the business of Steve C. Maples Co., also Tulsa. The Maples company will be operated as a division of Allan Edwards adding to its pipeline, refinery, gasoline plant and other industrial plant equipment service. A branch warehouse at Pampa, Texas, will be maintained.

The Bureau of Mines bulletin 265, "Leakage from High Pressure Natural Gas Transmission Lines" by E. L. Rawlins and L. D. Wosk, has been reissued. First issued in 1928, it has long been out of print. However, the basic principles of the testing methods still apply, and it contains much information that is helpful in constructing and operating modern pipelines. The investigation on which the bulletin is based included more than 200 leakage tests on 75 pipelines. It is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 45 cents a copy.

The Republic Natural Gas Co., Dallas, last month announced the sale of its gas gathering system in Hugoton field to Northern Natural Gas Co., Omaha. Facilities were sold for $3,415,839. The system is in Morton and Stevens counties, Kan., and is connected to 213 gas producing wells owned by Republic. This company has been gathering the gas for delivery to Northern's trunk system.

Construction was begun last month on a line for Ohio Valley Gas Corp. when Gov. George N. Craig of Indiana turned the first shovelful of dirt at the Ripley-Dearborn county line. The 27-mile line will transmit gas from the Texas Eastern Transmission Corp. system to Connersville. Cost of the line, expected to be completed in six weeks, is about $600,000.

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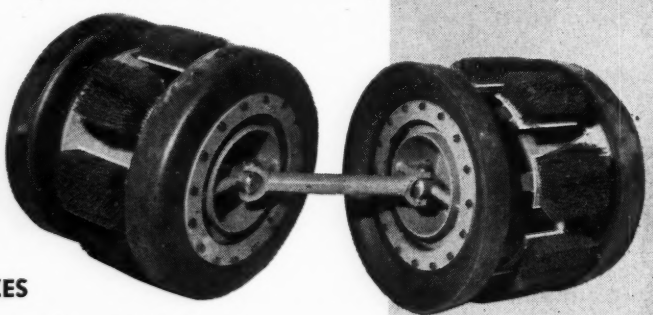

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*These 2 jointed Pigs traverse welding ells. Other models traverse all pipeline gate valves.

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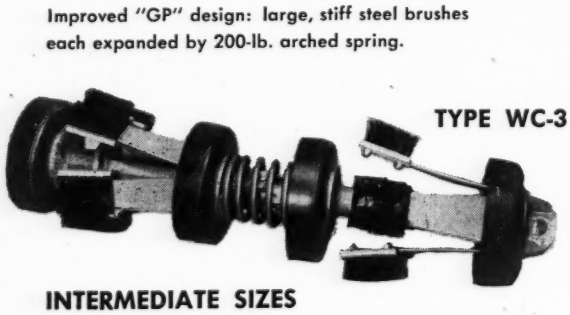

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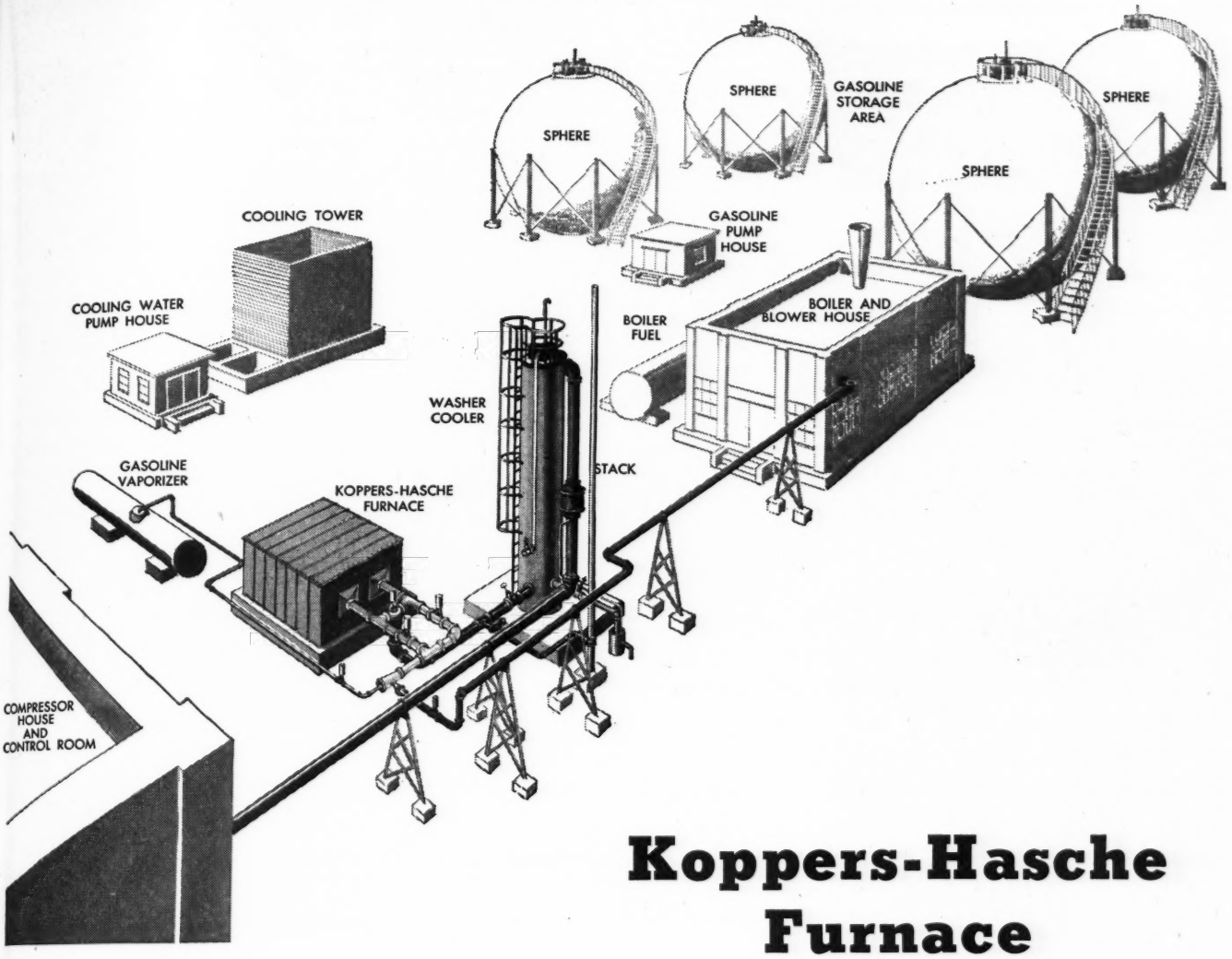
TORONTO . . . BUENOS AIRES . . . DURBAN, NATAL, SOUTH AFRICA



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The Hasche Furnace is invaluable in helping utility companies meet peak loads. Also, for industrial plants which use natural gas, as well as for utilities which distribute natural gas, this furnace is always ready to pinch hit in the event of temporary failure of the natural gas supply.

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Extreme simplicity of process makes initial investment low compared to other types of production facilities. Savings are effected not only on furnace cost, but also on auxiliaries. Complete plant is compact, requiring relatively little ground space. Most of the equipment can be installed outdoors, saving cost of protective housing.

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Upper Right—An Equitable Gas System 20" line through rough country. Upper Left—First coat of Roskote being sprayed on this line in the field, no primers needed. Bottom—The pipe is then wrapped with Royston Glas-Wrap and given a second coat of Roskote.

Not just the easy jobs for Roskote! It's tough enough to withstand the abrasion and corrosion of any soil, keeps its flexibility from -40° to 375°F. without brittleness or sag. Utility and pipeline companies know they can forget their corrosion worries when their pipe is "Roskoted". Roskote is applied cold, dries fast to save time and is non-toxic. It resists acids, alkalies and moisture—has an electrical resistivity of 20 megohms per square foot.

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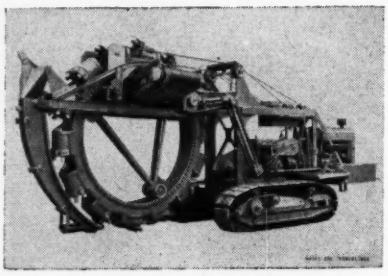
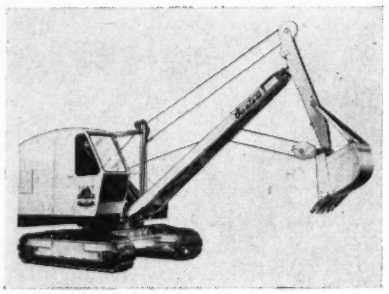


16 Trencher

Two new wheel-type Trenchliners are now being produced by Parsons Co. Both are full crawler-mounted machines. Model 215 is a special pipeline Trenchliner, while Model 202, shown, is designed primarily for drainage and utility trenching. Outstanding features of the 215, which is designed for "mile-a-day" production on cross-country pipeline installations, include six digging wheel speeds up to 11.2 rpm, standard-make tractor type crawlers with lug-type shoes, 18-in. treads, and choice of two standard-make 55 hp diesel engines. The 202 is equipped to dig in 30 separate feeds from 6.2 in. to 18.5 ft per minute, in 9 widths from 13 to 31 in. wide and up to 6 ft deep.

Parsons Co.

■



17 Crawler Crane

This new line of ⅜-yd, 5-ton crawler-mounted cranes, back hoes, draglines, shovels, clamshells, pile drivers and magnet cranes is designated C-35 by Schield Bantam Co. The crawler has two-speed independent travel enabling the operator to work a front-end attachment while travelling and swinging the machine; undercarriage has heavy-duty main frame and deep, rigid side rails; six track rollers provide even distribution of load; low ground-bearing pressures are provided with either of two size pads—5 psi with 16-in. pads and 3⅓ psi with 24-in. pads. Equipped with the 16-in. pads the Bantam has an overall width of 94 in. and runs 15,522 lbs including 1400 lbs counterweight, but without a front-end attachment.

Schield Bantam Co.

18 Compressor Unit

A new type gas compressor unit, the "Oilwell" Model DGE, driven by gears rather than belt drive, has been designed by Oilwell engineers. This gear-driven, duplex-type model is especially suited for gas lift operations, maintenance of bottom hole pressures, gathering and transmission systems.

A portable packaged unit, particularly adaptable for installation at confined or hazardous locations, it is being manufactured in three sizes. The gear design is more compact than the belt type making these compressors smaller in dimensions but with higher capacity. They have a 9-in. stroke and can be operated by either gas engine or electric motor. A specially designed cooling system has a two-section radiator with up-draft fan.

United States Steel Corp.

■

Trade Literature

19 Telemetering Booklet

A new booklet on telemetering, Bulletin M1710, contains information on the use of Bristol Co.'s Metameter telemetering instruments for remote recording, indicating, and automatic control of variables over distances from a few feet to many miles. Information and engineering data on modern methods of telemetering are included. Also described are Bristol's new Electronic Dynamaster transmitters and receivers. A number of typical installations on natural gas and oil lines are illustrated and described.

The Bristol Co.

■

20 Strain Gauge Bulletin

A new bulletin, No. 4103, describes the Baldwin SR-4 portable strain indicator, Type MA, which has been improved. The bulletin includes photodiagrams and complete description of construction, operation and performance of the indicator, which has self-contained a.c. power pack mounted inside the instrument case.

Baldwin-Lima-Hamilton Corp.

■

21 Check Valve Catalog

A new 18-page catalog, No. 30, describes the Chapman tilting disc check valves. The valves are made in iron bronze and steel for working pressures up to 3000 psi. The catalog includes detailed descriptions of the operating principles, diagrams and charts giving details of construction and sizes. A series of photographs shows some typical installations of the tilting disc check valves.

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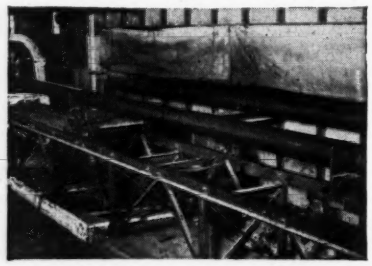

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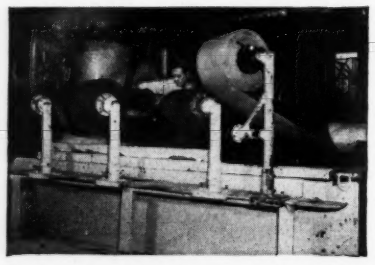

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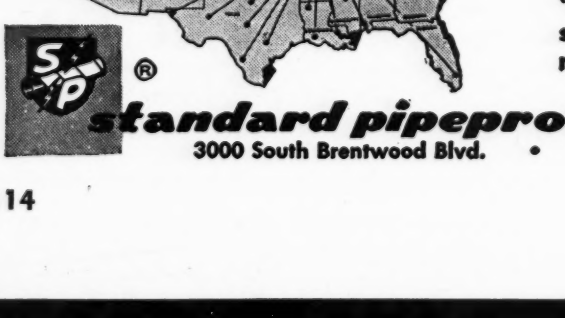

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Progress Reports

PLANNED

CAROLINA NATURAL GAS CORP., Charlotte, N. C. Docket G-1956 for 40 miles of line to connect with Transco line near Kings Mountain, N. C., extending to Rock Hill, S. C., with laterals to four South Carolina points.

CENTRAL KENTUCKY NATURAL GAS CO., Charleston. Docket G-2192 for 5 miles of 20-in. lateral extending from connection with Gulf Interstate in Menifee county, Ky. to its own Means, Ky. compressor station.

CENTRAL WEST UTILITY CO., Kansas City. Docket G-1682, four alternate plans to serve Clay county, Mo.

CHATTAHOOCHEE NATURAL GAS CO., Birmingham. Docket G-2066 for 70 miles of line in northwest Georgia, to connect with system of Southern Natural in Floyd county.

CITIES SERVICE GAS CO., Oklahoma City. Docket G-2149 for 69 miles of line—44 miles 20-in.; 25 miles 16-in.—and 1100-hp addition to Edmond compressor in Oklahoma county.

COLORADO INTERSTATE GAS CO., Colorado Springs. Docket G-2121 (1954 program) 365 miles of 22-in. line from Denver to connection with proposed Pacific Northwest Pipeline Corp. line at Green River, Wyo., with 5500-hp compressor station at Green River.

CONNECTICUT GAS CO., Berlin. Docket G-1954 for 3 short pipelines, totaling about 2 miles, to extend from Connecticut Light & Power gas plants to Algonquin Gas Transmission Co. from Waterbury, Willimantic and Putnam, Conn.

EAST OHIO GAS CO., Cleveland. A 125-mile, 26-in. pipeline to serve Cleveland area from point just south of Toledo.

EQUITABLE GAS CO., Pittsburgh. Docket G-2130 to activate the Logansport storage field in the Big Injun Sand, Marion county, W. Va., install a 1320-hp compressor station in Wetzel county, about 9 miles of 12-in. line from storage pool to compressor station, and various 6-in. and 8-in. well connecting lines.

GLACIER GAS CO., Butte, Mont. Dockets G-1816, G-1817, G-1818 for 285 miles of 20-in. line from northeast of Kalispell, Mont. to Spokane, Wash.; 91 miles of 8⅝-in. from Spokane to Lewiston, Idaho; 120 miles of 16-in. from Spokane to Hanford, Wash.; 130 miles of 12¾-in. from Spokane to south of Trail, B. C.

KANSAS-NEBRASKA NATURAL GAS CO. INC., Phillipsburg, Kan. Docket G-2186 for 41 miles of line in Kansas and Nebraska, and a new compressor station from items salvaged from abandoned station.

MANUFACTURERS LIGHT & HEAT CO., Pittsburgh. Docket G-2193 for 72 miles of 20- and 16-inch line, 38.7 miles of storage and well lines, 2 measuring stations and a 1760-hp compressor station at the Victory storage field in Marshall and Wetzel counties, W. Va.

MISSOURI CENTRAL NATURAL GAS CO., Macon, Mo. Docket G-1509 for 25 miles of 6-in. from Moberly to Macon, Mo.

MISSOURI PUBLIC SERVICE CO., Warrensburg. Docket G-2057 for 109.3 miles of 8- and 10-in. mainline and 27.1 miles of lateral lines. System to connect with Panhandle Eastern Pipeline Co. line at Franklin, Mo. and extend northwest.

MORGANFIELD NATURAL GAS CO., Morganfield, Ky. Docket G-1935 for a 31-mile, 4- and 6-in. line lateral to proposed Texas Gas Transmission Corp. line, to serve 6 Kentucky towns.

NEW YORK STATE ELECTRIC & GAS CORP., Ithaca. Docket G-1999 for total of 49 miles of pipeline; 25 miles 10-in. from DeRuyther to Norwich, N. Y., 24 miles 8-in. from Norwich to Oneonta, N. Y.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh. Docket G-1980 (in part) for a 75-

mile, 20-in. line from southern end of Driftwood field line to main dual line in Armstrong county, Pa. To be constructed in 1953.

NORTHERN NATURAL GAS CO., Omaha. Docket G-1918 for 400 miles of 24-in. pipe from the United States-Canadian border to a point near Minneapolis and two compressor stations with 5280 hp each.

NORTHERN NATURAL GAS CO., Omaha. Docket G-2009 for a 1.4-mile, 8⅝-in. branch line from its Omaha branch line to a proposed regulating station near La Platte in Sarpy county, Neb.

NORTHERN NATURAL GAS CO., Omaha. Docket G-2063 (in part-second year program) for 204 miles of 24-, 26- and 30-in. mainline additions to connect with Permian Basin Pipe Line Co. system, and 22,800 hp in new and existing stations in Texas, Oklahoma, Kansas, Nebraska, Iowa, Minnesota and South Dakota.

NORTHWEST NATURAL GAS CO., New York. Docket G-996 for 992 miles of 18-, 20-, 22-, and 24-in. line in Washington, Idaho, Oregon and British Columbia, together with laterals and four compressor stations aggregating 30,800 hp.

OHIO FUEL GAS CO., Columbus. Docket G-2194 for 69 miles of 20- and 24-in. lines and 3000-hp addition to Crawford compressor station.

PACIFIC NORTHWEST PIPELINE CORP., Houston. Docket G-1429 for 1466 miles mainline; 380 miles of spur and lateral lines; and 16 compressor stations totaling 104,420 hp, to extend from Ignacio, Colo., in the San Juan basin, to Bellingham, Wash. (Seattle area).

SHENANDOAH GAS CO., Lynchburg, Va. Docket G-1448 for 39 miles of line from a point near Middletown, Va. to points near Winchester, Va. and Martinsburg, W. Va.

SOUTHERN COUNTIES GAS CO., Los Angeles. Docket G-2182 for 14 miles of 24- and 22-in. pipe from connection with Blythe-Santa Fe Springs line near Brea to Santa Ana.

SOUTHERN NATURAL GAS CO., Birmingham. Docket G-2065 for line tap and metering and regulating facilities to supply Chattahoochee Natural Gas Co.

TENNESSEE GAS TRANSMISSION CO., Houston. Docket G-1969 for certificate to perform natural gas transmission service for Niagara Gas Transmission Ltd., Toronto, and Iroquois Gas Corp., Buffalo. To construct 574-mile, 30-in. line from Kinder, La. to join existing system; 130 miles of loop line; a 45-mile spur from near Buffalo to international border; submerged crossing of the Niagara river; 17,520 hp additional at existing compressor stations; 3 new stations; and 158 miles of lateral lines.

TRANS-CANADA PIPE LINES LTD., for 2200-miles 30-in. line from Alberta to Toronto; 24-in. line from Toronto to Montreal with 14-in. line to Ottawa; 747-mile gathering system and 13 compressor stations totaling 94,160 hp.

TRANS-NORTHWEST GAS INC., Spokane. Docket G-2111 for construction of a 521-mile system to serve markets in eastern Washington and northern Idaho, starting at international border near Osoyoos, B. C., south to Hanford, Wash., east to Spokane and Wallace, Idaho, north again from Spokane area to Trail, B. C.

UNITED FUEL GAS CO., Charleston. Docket G-2192 for 88 miles of 30- and 20-in. line connecting a new 6000-hp compressor station to its own lines in W. Va., and that of Gulf Interstate in Boyd county, Ky.

WESTCOAST TRANSMISSION CO. INC., Wilmington, Del., 396 miles, including 270 miles from Sumas, Wash. to Portland, Ore. with short branches to a number of cities in the two states, and 126 miles of laterals and 26 measuring stations. To connect witth 662-mile, 24-in. line to be built by parent company, Westcoast Transmission Co. Ltd., from Peace river area of Alberta and British Columbia. Survey under way.

UNDER WAY

ALGONQUIN GAS TRANSMISSION CO., Boston. Facilities including several laterals remain to be completed. Construction Service Co. has contract. Work held up pending FPC hearings.

CHICAGO DISTRICT PIPELINE CO., Joliet, Ill.

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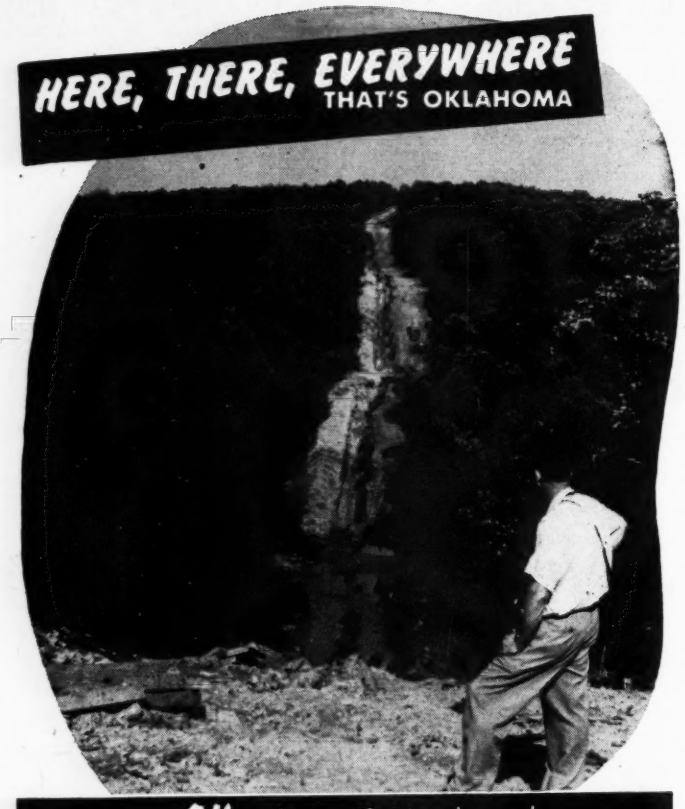

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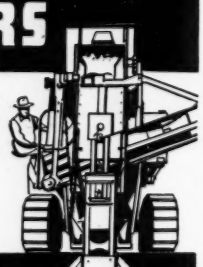

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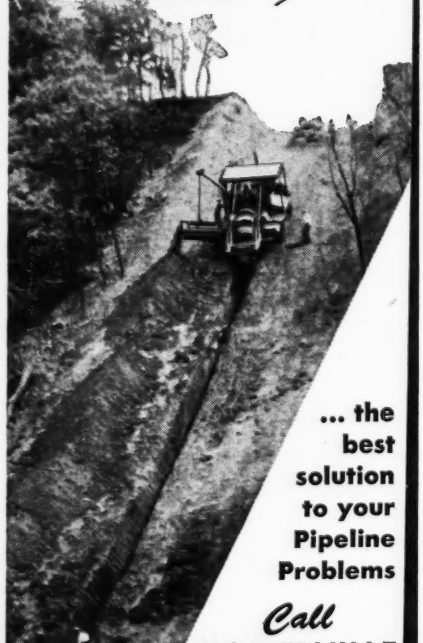

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Docket G-2090 for 3.4 miles of 36-in., 15.7 miles of 30-in. and a .2-mile river crossing of 24-in. pipe in the Chicago area.

CITIES SERVICE GAS CO., Oklahoma City. Docket G-2038 for installation of 11,400-hp compressor capacity—three 1600-hp units to be added to its Greenburg station, Kiowa county; six 1100-hp units in a new station in Harvey county, Kan. Expected to be complete Sept. 30, 1953.

EL PASO NATURAL GAS CO. Work in progress on plant construction for 153,000 hp in mainline and booster compressor stations.

GULF INTERSTATE GAS CO., Houston. Docket G-2058 to construct 860 miles of 30-in. line from Point Rayne, La. to Boyd county, Ky., 229 miles lateral lines and five 8000-hp compressor stations in four states. Contracts let to H. C. Price and Houston Contracting Co. Work underway, and expect completion Nov. 1.

LONE STAR GAS CO., Dallas. A 73-mile gathering and transmission system in Jack and Wise counties with a 3320-hp compressor station—the Jacksboro.

NORTHERN NATURAL GAS CO., Omaha. Docket G-1618 for 213 miles of 26-in. loop lines in Texas, Oklahoma, Iowa, Kansas, Nebraska and Minnesota, and 100,160-hp additional compressor capacity. Expect completion in October.

NORTHERN NATURAL GAS CO., Omaha. Docket G-2063 (in part—first year program) for 259 miles of 24- and 30-in. pipe and 50,400 hp in compressor capacity in new and existing stations in Texas, Oklahoma, Kansas, Nebraska and Iowa. Also 475 miles of branch lines and additions to serve Iowa, Minnesota, Nebraska and South Dakota. G. G. Griffis Inc., R. H. Fulton & Co. and Lone Star Contractors at work on mainline. All jobs under construction. Expect completion December.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-1651 for 86.25 miles, 34-in. loop and 19,540 hp addition on existing Topock-Milpitas line. Engineers Limited Pipeline Co. at work on loop construction. Bechtel Corp. at work at Topock, Hinkley and Kettelman compressors.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-1892 for 15 miles of 20-in. pipe extending from Helm and joining the system's Topoak-Milpitas line in Fresno county; and for 15.5 miles of 12¾-in. in Madera county parallel to the existing Madera-Livingston line, scheduled for construction in 1953-54.

PERMIAN BASIN PIPELINE CO., Omaha. Docket G-1928 for 234 miles of line and 54,880 hp in compressor stations to carry gas from Upton, Midland, and Pecos counties, Texas and Lea county, N. M. to connection with 24-in. El Paso Natural line to Dumas, Texas. R. H. Fulton at work on mainline. Completion io December.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.,** Los Angeles. Docket G-1718 for 13,520-hp additions to compressor facilities on existing line from California-Arizona boundary to Los Angeles. To be completed in September. A 5000-hp station in operation.

SOUTHERN NATURAL GAS CO., Birmingham. Docket G-1907. Total project approved including 792 miles of line and 18,500-hp compressor capacity—about 522 miles of looping on existing system with addition of 5400 hp to existing stations, about 270 miles in new lines and 3 new compressor stations. Miscellaneous sized lines for gathering system, 384 miles to be laid south of Gwinville, Miss.; add 5400-hp compressor at Gwinville; new 5400-hp station at Ellerslie, Ga.; 4400-hp station at Macon, Ga; and 3300-hp station at Toca, La. Brown & Root Inc., H. C. Price Co. and Houston Contracting Co. at work with completion expected in 1954.

TENNESSEE GAS TRANSMISSION CO., Houston. To build 369 miles of line in 1953, enlarge two compressor stations and complete one new station. Of the total pipe, 173 miles will be 30-in. loop; 74 miles, 26-in. loop; and 132 miles of 24-in. line from Mercer, Pa. to Hebron storage field in Potter county, Pa. Addition of 2640 hp will be made at Carrollton, Ohio station; 2200 hp at Mercer, Pa., and a new 6600-hp station will be built at Kinder, La. H. C. Price Co. and Bechtel at work on Mercer-to-Hebron line, and Oklahoma Contracting, and Anderson Bros. at work on loop lines.

TEXAS ILLINOIS NATURAL GAS PIPELINE CO., Chicago. Docket G-1914 for six new compressor stations totaling 70,000 hp on its Texas to Illinois transmission line and installation of additional units totaling 10,000 hp at five existing stations. Also for construction of a suspension bridge across the Mississippi river and lateral lines to connect additional gas reserves to system. Contracts have been let for compressor work. Completion date, Dec. 1.

UTAH NATURAL GAS CO., Salt Lake City. To build a 62.8-mile 18-in. pipe from fields in Carbon, Emery and Sanpete counties running northwest to a point near Provo. R. H. Fulton & Co. is the contractor.

PENDING CONSTRUCTION

ATLANTIC SEABOARD CORP. and **VIRGINIA GAS TRANSMISSION CORP.,** Charleston, W. Va. Docket G-2062 for two compressor stations totaling 10,560 hp.

EAST TENNESSEE NATURAL GAS CO., Knoxville. Docket G-1336 for a 100-mile, 16-in. line from near Knoxville to Kingsport, Tenn. with about 58 miles of various sized lateral lines.

HOME GAS CO., Pittsburgh. Docket G-2059 for 19-mile pipeline in Tioga and Broome counties, N. Y.

IOWA-ILLINOIS GAS & ELECTRIC CO., Davenport. Docket G-2012 for 22 miles of line to connect with Natural Gas Pipeline Co. of America's system in Mahaska county and extend to a point in Ottumwa county, Iowa.

NATURAL GAS CO. OF W. VA., Pittsburgh. Docket G-2059 for 21.3 miles of line and retirement of 14.7 miles in Columbiana county, Ohio.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh. Williams-Austin Co. has contracted for 10.8 miles of 20-in. line from Craigs Corners to Caledonia, N. Y. pending FPC approval.

MANUFACTURERS LIGHT & HEAT CO., Pittsburgh, Pa. has let contract to Dravo Corp. to install an 880-hp compressor station in West Bradford township, Chester county, Pa.

NEVADA NATURAL GAS PIPE LINE CO., Las Vegas. Docket G-1888 for 110 miles of 10-in. line from Topock, Ariz. to Whitney, Nev., serving Las Vegas and Henderson areas. Contract let to R. H. Fulton Co., Lubbock, Texas. Construction scheduled to start in September.

SOUTHEAST ALABAMA GAS DIST., Birmingham. A "U" shaped system of about 330 miles to serve 24 communities in southeastern Alabama from connections with Southern Natural.

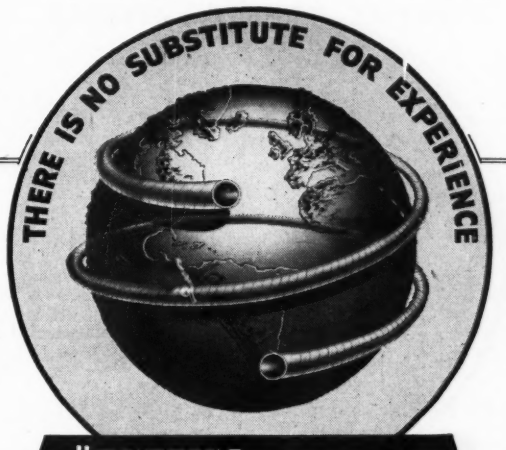
SOUTH CAROLINA NATURAL GAS CO., Columbia, S. C. Docket G-1961 for a 160-mile pipeline in Aiken, Lexington, Richland, Orangeburg, Dorchester, Charleston and Berkeley counties, S. C. Right-of-way being purchased.

UNITED FUEL GAS CO., Charleston. Docket G-2061 for 50.5 miles of 20- and 24-in. line from new 3300-hp compressor station at existing storage pool in Wood county to Lanham station in Putnam county, W. Va. Also acquisition of leaseholds and authority to drill wells, install well and field lines for new storage pool. Additional 18 miles of line and 3300-hp compressor station approved.

APPROVED

COLORADO INTERSTATE GAS CO., Colorado Springs. Docket G-2120 (1953 program) 49 miles of 20-in. loop line on line near Denver; 30 miles of 12-in. to connect 20-in. with Morton county, Kan. compressor station; 24,860 hp compressor capacity at new and existing stations in Colorado, Oklahoma, Texas, and Kansas.

EL PASO NATURAL GAS CO. Docket G-2106 for total of 1056 miles of line to include about 750 miles of 30-in. and 70 miles of 24-in. mainline with related gathering lines, purification facilities and compressor plants totaling 161,860



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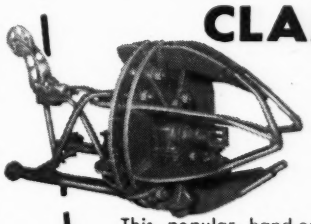

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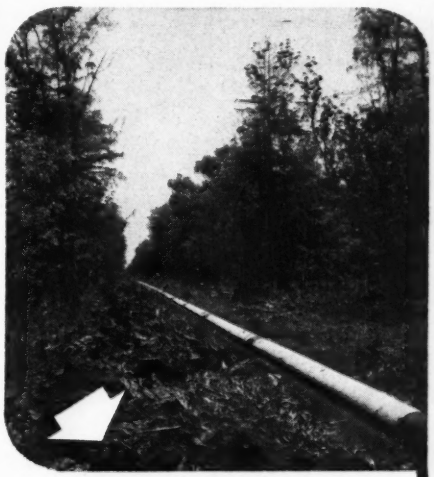

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hp to carry gas from Permian and San Juan basins.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-2102 to build about 220 miles of 34-in. mainline loops and 2500 hp in compressor capacity on line from Topock, Ariz. to a point near Milpitas, Calif.; and 6.5 miles of line between Milpitas and Irvington, Calif.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.,** Los Angeles. Docket G-2104 to build about 73 miles of 30-in. mainline loops and 5280 hp in additional compressor capacity at Blythe on existing line extending from Blythe to Santa Fe Springs, Calif.

Pipeline People

JOHN E. TAYLOR has been named assistant superintendent, gas pipeline department, of Arkansas Louisiana Gas Co., Shreveport. He has been serving as operations assistant in that department.

Formerly a mechanical engineer at the Kansas City office, K. E. KALEN has been appointed assistant superintendent of compressor stations of Panhandle Eastern Pipe Line Co.

A. P. KRAMER has been appointed sales and service manager for the Cleaner Pipelines Co., No. Kansas City, Mo. Mr. Kramer has been general superintendent in charge of the operating department of the Great Lakes Pipe Line Co.

The Henry J. Kaiser Co. has announced the promotion of L. H. OPPENHEIM to a vice president of the parent company. Mr. Oppenheim, who joined the company in 1938, will continue to serve as assistant general manager of Kaiser Engineers in Oakland. JACK W. WALLING has been appointed manager of industrial relations for the engineers division.

LUTHER EVANS, director of industrial relations of Dow Chemical Co.'s Texas division, has been elected to the board of directors of Dowell Inc., a subsidiary of Dow. He replaces DR. WILLIAM R. VEAZEY of Midland, Mich., who retired June 2.

Perrault Equipment Co., Tulsa, has announced the addition of C. H. MURPHY, St. Joseph, Mo., to its staff as administrative manager.

J. PAUL ROGERS will be manager of the new gas supply department formed to serve Lone Star Gas Co. and Lone Star Producing Co., both of Dallas.

HARRY R. MOSELEY has been appointed Gulf Coast division superintendent for Texas Eastern Production Corp., Houston. Before transfer to Houston in December, Mr. Moseley was district petroleum engineer at Shreveport.

ALBERT H. BORCHARDT, vice president and veteran of 44 years with Worthington Corp., has announced his retirement.